THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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	Page
Statesmanship for Manufacturers	561
Co-operative Exhibiting	562
The Fees of Expert Witnesses	562
Domestic Water-Heating by Electricity (*illus.*)	563
Notes from India	563
Compensating Voltmeters (*illus.*)	564
Correspondence :—	
The Use of Mica in the Insulation of Electrical Apparatus (*illus.*)	564
Re Contracts in India	566
Knife Switches	566
Electricity and Small Water Supplies (*illus.*)	567
An Automatically-Operated Mining Locomotive	567
Australian Tramway Companies and their Employés.—VIII	568
New Electrical Devices, Fittings and Plant (*illus.*)	568
Business Notes	570
Notes	578
A Model Fire-Alarm Station (*illus.*)	579
Large Direct-Current Generators for Electrochemical Purposes (*illus.*)	581
English Gas-Engine Plant for Japan (*illus.*)	581
Railless Electric Traction in Dundee (*illus.*)	582
The Engineering Exhibition at Olympia (*illus.*)	583
City Notes	588
Stocks and Shares	589
Market Quotations	590
Share List of Electrical Companies	591
Electrical Fittings and the Law of Landlord and Tenant	593
The Electric Driving of Washing Machines	593
A Few Remarks on Cookers	594
Proceedings of Institutions :—	
Rolling Mill Practice in the United States	595
A New Type of Large Gas Engine (*illus.*)	596
The Magnetic Properties of Manganese and Nickel Steels (*illus.*)	597
Cast-Iron Pipes and Superheated Steam	598
The Institute of Metals	598
Trade Statistics of Japan, 1911	599
New Patents Applied For, 1912	600
Abstracts of Published Specifications	600
Contractors' Column	Advertisement pages xxii and xxiv

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STATESMANSHIP FOR MANUFACTURERS.

STUDY the prospective markets and nurse them! Organise a foreign trade campaign! Co-operate in reason with your British rivals in order effectively to meet foreign competition! Advertise to the whole world your ability as an up-to-date manufacturer!

To readers of the ELECTRICAL REVIEW such advice as the foregoing is not unfamiliar. Indeed, it is very much like a selection of texts from a series of our own. On this occasion, however, we quote the suggestions from a statesman of experience, Lord Selborne, who uttered them last week at the opening of the Olympia Machinery and Engineering Exhibition. Writers in the trade Press may say such things as the outcome of special study, and as the result of urgent warnings received from qualified observers; trade commissioners and consuls also may offer similar counsel in very definite terms; but we are afraid that too often such suggestions have come to be regarded as a matter of course when passed through such channels, and we have noticed occasionally a disposition to treat them as more or less idle talk. We would remark at once, however, that we believe that disposition to be breathing its last, though ultra-conservation still occasionally betrays itself. In the electrical and engineering trades especially have we noted with feelings of deep satisfaction the new spirit that has in recent years entered into British investigation of foreign trade possibilities, while there is also a slight movement toward more efficient organisation, a more sympathetic attitude toward the principle of co-operation to gain common ends has been engendered, and save in a few exceptional cases, the desire to hide one's light under a bushel no longer occupies the breast of our manufacturers.

So far, then, the spirit, the attitude, the desire, have undergone a healthy change. The recognition that a certain course of procedure is wrong is not enough. If the pace has been too slow, it must be speeded up; if the method of doing business be obsolete, it must be scrapped in favour of the more efficient though more exacting system which altered conditions have necessitated; if orders from new markets be desired, we have got to do something more than wish for them. Sentiments are of little avail, a mere assent to the editorial proposition that these days demand more active effort in a foreign field is of little use, from our national and individual manufacturing point of view, unless we take some very definite course to extend our trade—unless we become thoroughly aggressive. These, we know, will be termed platitudes; they are—we admit it.

Can we say, though, with such reflections prominently in mind, that our manufacturers and traders are doing their best to maintain and develop the British position abroad, seeing that a strong policy is essential for productive activity and prosperity to be continued at home in the years that are to come? If we understand the views

of Lord Selborne, as reported in the Press, he, at any rate, is not satisfied with the position of affairs. Speaking as the result of his experience in an office of high authority in South Africa, and assisted also by the suggestions of students having other coigns of vantage from which to view the battle, he appeals to the British manufacturer to pay heed to the alertness of foreign competitors in getting their feet early into new trade territory, and he suggests, as a study well worthy of the statesmanship of our manufacturers, "the nursing of prospective markets." Of course we are in the most complete agreement with his lordship, for again and again have we urged our firms to take a large view of export matters, not being content with a mere inquiry and order-book business producing an immediate profit, but establishing a connection in, and a hold upon, new markets where an immediate satisfactory return was out of the question. In recent years we have emphasised the forward movement or awakening that was taking place among the people in such markets as China, Turkey, Russia and South America, all of which must inevitably soon bring a huge demand for modern facilities; also the hopefulness that should exist with regard to trade in Canada, Australia, India and South Africa. It used to be said in some quarters that our electrical firms could not afford to stand the financial drain involved. We have seen in a number of cases that that objection has been falsified by practical experience, even when trade was not good, and profits were smaller.

But to-day—What of the position in 1913? Reports from every hand show that electrical engineering works are full of business, extensions to works are being carried out, order books are in a healthy state, deliveries cannot be promised as quickly as desired. A discordant note is struck by the report issued by one manufacturer this week, but the position described has arisen through exceptional losses, and one can only hope that it is but a temporary fall from ordinary dividend grace. Taking the outlook generally, we appear to be in the midst of a bigger boom than ever before. The weekly reports in the engineering Press have formed for some months past quite entertaining reading, showing the rush of business and the fulness of employment for labour. But booms do not last. We must profit by past experience, and remember the drop in the trade curve which comes as inevitably after the boom as the night follows the day. In times of depression we discuss things that are wrong, and mean to put them right when trade improves; as activity increases and the boom comes on, we are busy or we forget those good intentions. Now the best way, surely, is in time of boom when we can better afford it, to adopt this policy of nursing prospective markets, so that slackness when it comes will be less serious. We hope that the appeal of Lord Selborne for the matter to be dealt with in a statesmanlike, instead of a parochial, manner by British manufacturers will receive a sympathetic attention from those to whom it was addressed, and from all who are interested in strengthening the foundations of the citadel of British engineering.

Co-operative Exhibiting.

The suggestion for co-operation and advertisement touched upon briefly in the preceding article is a very timely one. It should not be passed over lightly, but deserves the most profound deliberation from all of us. There is an international exhibition to be held at Ghent, Belgium, next year. How can we secure that British electrical engineering shall have a really true representation in evidence? We can hear in a hundred offices at once the remark that "it is ridiculous to suggest that such a firm as ours could stand such a burden." We recognise the heaviness of the burden, but why not share it with your brother manufacturers? Surely that would be better than to see the foreigner go in and win. Mr. J. M. Robertson, M.P., the Parliamentary Secretary to the Board of Trade, who followed Lord Selborne, showed that he appreciated how great was the growing burden of individual displays at international exhibitions, but like many more of us, he also sees how imperatively necessary international advertisement of the manufacturing products of this country has become. We observe that even in Germany criticism is being offered that international exhibitions are following too closely on the heels of one another. It is feared that excess will lead firms to get into the way of holding aloof. It is understood, however, that the firms who, under the auspices of the Board of Trade Exhibitions Branch, entered into a co-operative arrangement at Brussels and Turin, found the efforts well worth while. Our foreign competitors have shown their satisfaction with exhibitions of this kind by increasing the space at succeeding shows, and it is certain that if we are not wide awake in respect of Ghent, we shall be eclipsed in a country which can afford us one of the best trade opportunities so far as the Continent is concerned. There will be no other great exhibition in Belgium for a decade, and the British Government proposes to make a special feature of engineering and machinery in the British exhibit. The fact that on the Continent there are to be met our keenest electrical rivals with their network of connections spread out in all directions must not be allowed to dictate a policy of apathy. British electrical apparatus must be advertised if it is to be known; it is likely to be known more effectively if it is *seen*. The quality of our production is high, why not let it speak for itself in a co-operative electrical advertising effort at Ghent? How far are rival competitors in the British electrical industry willing to join hands in a splendid effort to boost their products in the presence of Continental buyers and of those who will come from other foreign markets to visit the exhibition? Each may reduce the cost to the other and both stand to gain something. In our next issue we shall give some further details of the arrangements, and we venture to hope that some way will be found for ensuring that British electrical industry not only shall not suffer, but shall greatly gain, from the holding of this exhibition and from the facilities that the Board of Trade are placing at our disposal.

The Fees of Expert Witnesses.

It is interesting to notice that the President of the Incorporated Law Society has been attempting to blame the expert witness for the abnormal expense of modern litigation. If it be true that your expert demands and receives large fees, we see no reason why he should not do so. Anyone who has had experience of the law from the point of view of the man who is summoned to assist the Court by giving evidence will appreciate that the fee charged may very properly be out of proportion to the time spent in the witness-box. A busy engineer may have to make a preliminary report, travel to a remote part of the country to view the *locus in quo*, attend numerous conferences, make plans, models, and drawings, and conduct experiments. Surely he is entitled to charge a reasonable sum for all these services which make a very serious demand upon his time? His fee is but the reward of talent and experience. May we suggest to Mr. Samson that the lawyer's bill of costs might often be materially reduced if the client were advised to consult a technical expert at the earliest possible moment? Suppose, for instance, the question at issue is whether a generating plant is capable of doing the specified work. The lawyer may advise as to the construction of the contract; the lawyer's client who supplied and erected the plant may be satisfied in his own mind that it complies with the contract, and may have sufficient force of character to impress his legal advisers with the same view. But an independent expert will look at the whole matter from a more or less impartial standpoint, and may well be in a position to switch off a very expensive current of litigation.

DOMESTIC WATER-HEATING BY ELECTRICITY.

Herr A. Ritterhaussen, in a paper read before the Verband Deutscher Elektrotechniker recently,* discusses the importance both to the consumer and to the supply engineer of electric water-heating for domestic use.

He points out that about three-fifths of the heat required for domestic purposes (exclusive of that for room warming) is used for heating water, and if this is to be supplied electrically so as to compete favourably with gas or coal, the charge for electricity must be a lower one than is usually possible under ordinary circumstances.

The difficulty can be overcome, however, if some form of heat storage is employed for the water-heating, so that the required energy can be supplied to the apparatus not necessarily when the hot water is required by the consumer, but at times of light station load, such as the early morning or

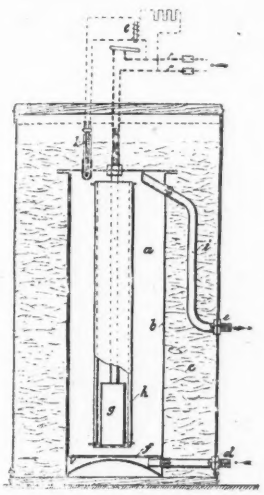


Fig. 1.

the daylight hours. Such a load, completely under the control of the supply station, can, of course, be economically supplied at a very low figure, and may, eventually, prove a valuable means of levelling the load curve.

To meet this requirement, Herr Ritterhaussen, after long experiment, has developed an interesting form of heat accumulator which he claims competes favourably as regards first cost, working cost and simplicity with the gas-heated "geyser" and similar rivals.

The arrangement of this is shown in the section, fig. 1. The heat accumulation takes place in the water itself, the heat being given off by the heating body *g* at the bottom of the circulating tube *h*, and conveyed by convection to the top of the main chamber *a* in the neighbourhood of the outflow pipe *i*. As hot water is withdrawn by the consumer, fresh cold water from the mains enters by the pipe *d* at the bottom, and the perforated plate *f* serves to prevent all eddying and mixing of this cold inflow with the existing hot water.

The cold water thus remains at the bottom, and passes gradually into the circulating tube *h*, and, after heating, to the top of the chamber. The well-known fact, that in a vertical chamber, such as this apparatus forms, heat travels downwards only very slowly, makes it possible for the cold and hot waters to remain in this way in the same chamber for an extraordinarily long time without mixing. Thus, at any moment the full amount of hot water corresponding to the energy supplied is immediately available.

Heat dissipation is reduced to a minimum by surrounding the water chamber by an 8-in. thick coating of very loosely packed silica. No metallic connections between the water and the outer casing occur, except the inflow and outflow pipes. The inlet pipe is only in contact with cold water, since no appreciable heating occurs below the bottom of the circulating tube, and, therefore, no loss occurs through it. Loss through the outlet pipe is practically prevented by the simple device of carrying the pipe in a downward direction for some distance (about 18 in.) in the non-conducting coating as shown. With this arrangement all convection currents in the pipe are prevented, and so extremely little heat escapes through the pipe, whilst with a pipe directed upwards, or even horizontally, and however well lagged, a prohibitive amount of waste was found to occur.

The accumulator is provided with a simple automatic cut-out which disconnects the supply as soon as the desired temperature is reached, and reconnects it after water has been drawn off. This consists of a contact thermometer *k*, and an electromagnetic mercury switch *l*. This device only consumes about half a watt, and since the temperature changes in the accumulator take place extremely slowly, the mercury switch only has to operate very occasionally, and has a very long life.

The apparatus is thus wholly automatic, and is also in no way disturbed, if, at certain times of the day, the supply is entirely cut off, either by a time switch or by hand.

E.T.Z., August 22nd, 1912.

NOTES FROM INDIA.

[by our special correspondent.]

Dacca.—Under the old scheme of things when this very ancient and highly interesting city was the capital of the new province of Eastern Bengal and Assam, a concession for electric lighting and tramways was, after considerable delays and expense, granted to Messrs. Octavius Steele & Co., of Calcutta. In due course a company was formed, the necessary capital was subscribed, some locally, some in England, orders were given for the plant at home, and everything progressed satisfactorily. The old three-wire 440-volt central station, which was a free gift of the old Nawab of Dacca to the citizens, was to have been absorbed in the new power scheme and the existing overhead bare copper mains utilised to some extent.

Suddenly, and without warning, came the news of the Delhi Durbar booms, one of which, in response to a fierce agitation among Bengalis, was to nullify the partition of Bengal, and by a stroke of the pen the province of Eastern Bengal was wiped out and the proud city of Dacca reduced to its former decaying position. Interest in the new electric lighting scheme ceased for the time, orders not executed were cancelled, and the promoters of the scheme were naturally very disappointed and dissatisfied. Now, however, after a lapse of several months the newly-appointed Governor of Bengal has signified his intention of making Dacca his headquarters for at least two or three months a year, and active work on the new lighting scheme has again commenced. By March, 1913, it is hoped that the machinery will be in operation, and current from the new power house in the mains. The Bengal Government, it is said, has guaranteed a certain minimum consumption per annum, sufficient, at any rate, to pay yearly establishment charges and maintenance; and it is anticipated that street lighting and private consumers will yield a sufficiently large revenue to go towards paying a dividend.

Agra.—Tenders are being called for a lighting scheme for this ancient and beautiful Moghul city and cantonments. It is not generally known as yet whether the Government are allotting the necessary funds; or whether it is in the initiative of a private syndicate who have obtained a lighting concession. A new electrical inspector has recently been appointed in the United Provinces, and contractors are not yet familiar with his methods.

Wire.—Government engineers are frequently specifying metal-covered wires in India in these days, the popular favourites being "Stannos," imported by Messrs. Siemens, and Henley's system. As these metallic-covered wiring systems are cheaper and neater than, and probably as durable as, either wood casing or conduit work, neither of which in India is very lasting, wire manufacturers who have not yet put a "system" on the Indian market should wake up and meet a want, instead of, as some wire manufacturers'

agents do, wasting time and misplacing energy in decrying the "systems" which are growing in popularity.

The wiring method which has stood the test of time is undoubtedly teakwood casing work spaced away from walls on small porcelain button insulators; but a new fashion has come in—whether to stay or not is a debatable point—and it must be catered for even temporarily.

Electric Drive for Mills.—A new flour mill driven electrically has been opened recently by Messrs. Andrew Yule, of Calcutta. The motors are by the Lahmeyer Co., running direct off the Supply Co.'s H.T. 6,000-volt mains. The consulting work was in the hands of Mr. Speyer, who explained the economy of motor drive to an interested audience of commercial men.

COMPENSATING VOLTMETERS.

By F. T. HOMAN, A.M.I.E.E.

It is frequently of advantage to be able to measure at the generating station the voltage at the feeding point of a feeder without resorting to the use of pilot wires. For this purpose compensating voltmeters may conveniently be used; their main advantages are:—

1. The low cost of installation and upkeep.
2. The elimination of frequently troublesome pilot wires.

Fig. 1 shows a diagram of connections for a voltmeter applied to a single feeder.

B is a high series resistance provided with three terminals, and is connected across the bus-bars.

A is a low-resistance shunt inserted at the bus-bar end of the feeder.

It will be noted that the effect of the shunt A is to oppose the drop across the few turns of high resistance to which the voltmeter is connected, and, consequently, when there is any load on the feeder, the voltmeter reading is correspondingly reduced to allow for the voltage drop on the whole length of the feeder.

The shunt may conveniently be dispensed with altogether by using instead a short length of the feeder cable itself, such

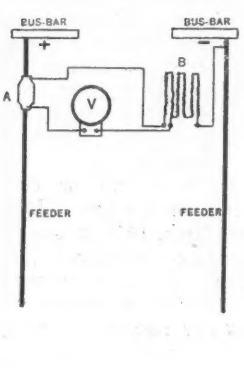


Fig. 1.

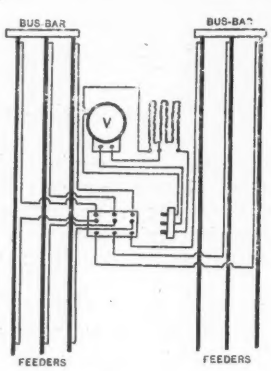


Fig. 2.

that the resistance corresponds with the calculated resistance of the shunt. This will not usually mean tapping more than about 20 ft. of feeder.

By the adoption of a suitable plug or switch arrangement a single instrument may be used on several feeders.

Fig. 2 shows the connections for three feeders, using a three-pin plug and sockets, and employing a length of feeder in place of the shunt in each case.

The "moving-coil" and "hot-wire" types of instruments are suitable for use as compensating voltmeters; the electrostatic type is, of course, unsuitable.

The above remarks apply to direct-current working. For alternating-current systems a similar arrangement is possible; the high resistance will be non-inductive, and a reactance will be used in place of the shunt. Instruments of the "induction" or "hot-wire" types may be used.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Use of Mica in the Insulation of Electrical Apparatus.

If you will permit us, we should like to make a few criticisms and add a few notes to the very able article on the above subject by Messrs. Fleming and Johnson, in the recent issues of the Electrical Review.

We agree with the writers that there is a lack of knowledge amongst electrical engineers as to the limitations of this insulator in some directions, and also as to its use and advantages in other cases.

We also agree with the writers that the mottling on some of the muscovites does not greatly affect its insulating value for practical purposes. This mottled appearance is often caused by inclusions of magnetite and decomposed felspar (or china clay). Prof. E. Wilson some time ago carried out a series of experiments to ascertain the dielectric strength of various commercial micas; the results have been published, and we shall be pleased to forward a copy to any electrical engineer who cares to apply to us. The dielectric strength of the best clear ruby mica compared to spotted Bengal mica was as follows, the test pieces being 4 mils thick:—

Bengal ruby clear	...	5,250 volts per mil.
Bengal spotted ...	...	2,750 volts per mil.

We forward a direct contact photograph to show the form of the magnetite inclusions in the spotted mica of the same quality as the tested piece. The figures for the spotted

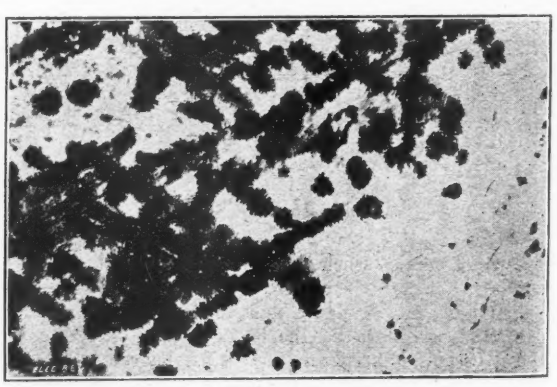


Fig. 1.—Direct Print from "Bengal Spotted Mica," showing Magnetite Inclusions.

mica are high enough for all ordinary purposes; the ruby clear is used largely for special high-tension work, condensers and so on.

We cannot agree that "amber" mica (phlogopite) is much more expensive to split than muscovite. By reason of its softness it requires a little more care, perhaps, than muscovite, but an expert, or properly trained splitter, using the *proper* form of knife would not consider it much more difficult to deal with if the edges of the slab had been trimmed as they should be for this purpose; that is, the mica should be trimmed round with a knife held on the slant, what is known in the trade as sickle trimmed, because the natives in India use a sickle for this purpose. If this is done before splitting, much time and waste will be saved in dealing with any kind of mica. The actual process of splitting correctly and economically is difficult to explain on paper, and can only be acquired by practice and training, a point that, we fear, is not generally realised.

We do not agree either that the cost of amber mica is three to four times that of soft green; about 25 per cent. to 50 per cent. extra would be nearer the mark.

We agree with the writers that the so-called "softness" of many micas is due entirely to the presence of moisture between the laminæ, and that all attempts to soften mica artificially by "annealing," or any other way that alters its structure, only result in partially or wholly destroying its

most valuable characteristics, particularly its insulating value, by the partial disintegration which these processes involve.

We certainly must protest most strongly against the statement that pure mica has only a restricted application on account of the limited area of the sheets. Mica can be obtained and is regularly sold in sizes up to 24 in. × 12 in., which is large enough for most purposes; nor, when one considers the way in which all large mica that comes on the market is absorbed at once, is it true to say that mica over

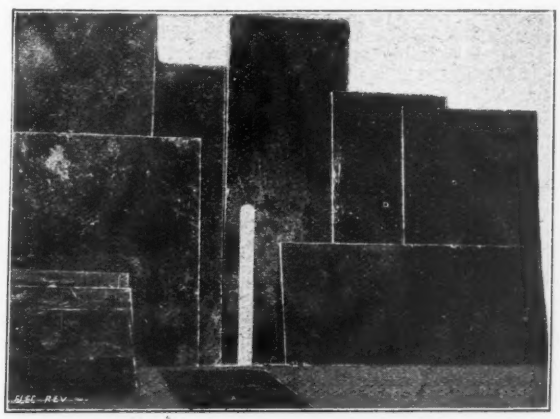


Fig. 2.—Large Mica Plates for Electrical Insulation.

12 in. long "is not a commercial proposition." We forward a photo herewith of part of an order we have just executed for some mica over 12 in. long (fig. 2). The rule shown in the print is a foot-rule, and this is typical of orders we also have in hand.

Referring to the use of pure mica in commutators, we cannot help thinking that there is a lot of nonsense talked about the relative hardness and softness of mica used for this work; whilst, on the one hand, we hear of engineers who are troubled with the uneven wear of mica and micanite in their commutators, there are plenty of firms who use the so-called hard micas and who never seem to have any trouble at all in this direction, which suggests that the cause of this trouble should be sought for elsewhere, a view which is shared by one of the leading insurance engineers, who naturally has exceptional opportunities for studying this question.

With reference to the respective merits of mica and micanite for commutator insulation, we sell large quantities of both insulators, and consequently we have a fairly good knowledge of the experience of the users, not only of material we sell ourselves, but also that from other sources, and there is no doubt that micanite gives far more trouble in use than pure mica, a view which we are sure is shared by the vast majority of electrical engineers; in fact, we have always made a point of asking every electrical engineer we meet, which he would prefer to use, apart from the question of cost, and in no instance can we recall a single answer in favour of micanite, whilst from the number of times we are asked to replace burnt-out micanite segments with mica, we think that this dissatisfaction is pretty general. The enclosed photo. showing one of these burnt-out segments—just received—shows well the usual trouble; the insulation is completely burnt away (fig. 3). As long ago as 1906, Mr. Michael Longridge, chief engineer of the British Engine, Boiler and Electrical Insurance Co., Ltd., stated in his annual report that he "deemed micanite unsatisfactory for use between commutator segments, and that *pure mica* should be used."

Micanite has very many uses, and although a long way behind mica, is nevertheless a very useful insulator, only it is unfortunate, in the interests of both buyers and manufacturers, that enthusiasts should rush in and claim for it virtues that it does not possess; even more than mica in some directions, it has its limitations, and one of these appears to be its unsuitability for commutator work. The reader has only to turn up the "Correspondence" columns of back numbers of the Electrical Review to see this, and it is unnecessary to go into the matter here.

When micanite was first put on the market, some years ago, it was then made very carefully and with large splittings; they were called No. 5 grade, but would to-day be classed as No. 4, so much have the gradings fallen in area since then. Makers then claimed for it a dielectric strength of 1,000 volts per mil, and undoubtedly it would and did stand this test. But to-day, although, with all these years of experience and practice behind them, one would expect manufacturers to produce a much better article than the early micanite, this is not so; its dielectric strength has fallen to about half of what it used to be, and the breakdown strain of most commercial micanite now seems to be about 500 to 600 volts per mil. This may possibly be a partial explanation of the dissatisfaction that exists amongst so many electrical engineers with this material. For this result the buyers are mostly to blame; they have constantly demanded a cheaper and cheaper article, and the manufacturers have nobly done their best to meet this demand, in spite of the always-increasing cost of raw material, &c. The whole value of micanite as an insulator depends upon the area of the splittings from which it is made, and no amount of careful workmanship, heating and pressing will compensate for No. 6 splittings being used instead of No. 5 or No. 4. If buyers are prepared to pay a good price for a good article, we are confident that manufacturers can produce a micanite far superior to anything at present on the market.

However, even at its best micanite must necessarily be far inferior to mica as an insulator. The binding cement, no matter how small a quantity is used, is always a source of weakness; it is liable to carbonise under the action of heat and to deteriorate under the action of ozone. The researches of the writers themselves demonstrate this in their valuable paper on "Chemical Action in the Windings of High-Voltage Machines," read before the I.E.E. at Manchester, February 14th, 1911, from which we beg to quote: "As regards the micanite samples, the mica itself was unaffected, but some action was observable on the varnishes used for cementing the laminæ together;" again, in summing up the results of their investigations, Messrs. Fleming and Johnson state that "Mica is itself unaffected, but the cements used in building it up are liable to attack on exposed surfaces." Mr. E. H. Rayner, M.A., of the National Physical Laboratory, in his paper on "High-Voltage Tests on Insulating Materials," read before the I.E.E. on February 8th, 1912, makes the following remarks with reference to micanite and mica. Where micanite was under test at high voltages ". . . . the material becomes rapidly hot and softens around the electrodes, swells by internal vapour pressure, and is finally pierced;" and later on, "Generally speaking, thin qualities up to about 1 mm. will withstand a stress of 20,000 volts

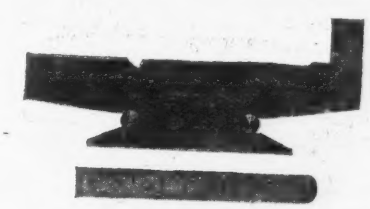


Fig. 3.—Micanite Commutator Section, showing Failure of the Insulation.

per millimetre in air for 10 minutes," (equal to 500 volts per mil, which bears out our contention stated earlier in this letter). "Above this thickness, up to 2·5 mm. there is more difficulty in making material which will withstand this stress." Speaking of pure mica, he said: "Mica may be run very near the breakdown point for a long time, and is unaffected by ordinary temperatures met with in machines." A test piece 0·04 mm. thick was subjected to 7,000 volts for two hours, and was not punctured, "although the steel ball electrodes were too hot to hold and the brush discharge stained the mica with a ring of iron oxide"; this strain is equal to 4,375 volts per mil of thickness.

There is no doubt that mica should be used as far as possible without any cement whatever, and this can be done

to a far greater extent than is realised if only a little care is used. To mention one use, pure mica tubes can be obtained consisting entirely of rolled mica and containing no cement whatever up to 12 in. or 18 in. long, and the increased cost is not so great as would appear at first sight, because these tubes can be used so much thinner, as they will stand a much greater breakdown strain than micanite tubes; to show that these are a "commercial proposition," we might mention that we have supplied thousands of such tubes to various electrical firms. If electrical engineers could only spend a few hours with a splitting knife and a few sheets of mica now and again, they would be astonished at what can be done with it; by splitting a large sheet up into plates about 1 mil thick, it can be bent round sharp corners or into slots as easily as micanite if precautions are taken to hold it in place, and there is always the advantage that much thinner insulation can be used with no fear of any changes taking place due to chemical action.

F. Wiggins & Sons.

London, E.C., *October 1st*, 1912.

Re Contracts in India.

In your issue of August 23rd, 1912, under "Correspondence," you published two letters signed respectively "One Interested" and N. M. Marshall, on the subject of contracts in India. On reading these letters, and taking into consideration the fact that they both appear under the same date, it seems to us that they were both inspired by one and the same mind, except that "One Interested" is accusing N. M. Marshall of being given preferential treatment by the Government, by being favoured with the contract for the Coronation lighting, and N. M. Marshall in turn accuses some firm, whose name he does not state, of being favoured in the same way that "One Interested" states that N. M. Marshall was favoured. Now, this correspondence certainly seems to indicate that either "One Interested" or N. M. Marshall is very much at sea in the statements made, and under the circumstances we think that a statement of fact may be of interest to your readers.

For a number of years past we have been estimating for Government work, and in some cases we have been favoured with orders, but in other cases the orders have gone to some other local firm here, and we feel sure that some of the orders which have passed us have not passed us on account of our prices being high.

Our own idea of this subject is that the Government does not always place orders with the lowest tenderer, because some firms here have a practice of cutting their prices to an absurd limit, and if orders were always placed with the lowest tenderer one firm would be favoured with practically the whole of the Government's orders, and other firms would become tired of tendering, so that the cheapest firm would eventually obtain a monopoly of Government contracts, and so stifle all competition.

We believe that the Government method here is to spread the work round as much as possible, so as to keep a number of firms available for their work, instead of giving the whole of the contracts to one firm, and the Government, when working on these lines, does not always appear to place orders purely on the question of price, but considers the nature of the work to be done, the class of material offered, and the abilities of the various firms to make a decent job of any orders placed with them.

The statement that the contract, amounting to Rs. 1,20,000 (£8,000), for the illumination of Bombay in honour of His Majesty the King's visit, was placed with one firm without other firms being asked to tender, is an absolute out-and-out misstatement of fact, and in support of our statement we enclose herewith a copy of our estimate dated June 1st, 1911, for the Coronation illuminations amounting to Rs. 1,25,000.

From this you will see that we were asked to tender, and that our price was only Rs. 5,000 higher than that tendered by the Parsee gentleman trading under the name of "N. M. Marshall," and sometimes as "Marshall & Co.," and it was Messrs. Marshall & Co. who booked this order.

We also know that other firms were asked to tender, but we do not know what their prices were, as the Government does not make a practice of issuing a return showing the various sums estimated for different installations.

You are at perfect liberty to publish any portion of this letter or of our estimate, and we think it a great pity that Government officials are not allowed by Government rules to defend themselves against such attacks as were made in your issue of August 23rd, 1912.

It seems to us that the only possible result of the letters written by "One Interested" and N. M. Marshall will be that the Government will decide to do the whole of its electrical work departmentally, and this will result in all orders for material being placed at home, and Bombay electrical firms will have a very bad time to look forward to. As it is, the Government is now doing a large amount of electrical work departmentally.

Pro **Greaves, Cotton & Co.**
J. Elliott.

Bombay, *September 20th*, 1912.

Knife Switches.

As a designer and manufacturer for many years, I would point out that, in approaching the above subject, consideration should be given to strong simple mechanical design, giving ample area of contact, sufficient cross-section, and pressure of contact between surfaces.

In designing switchboards, a maximum density of 1,000 amperes per sq. in. cross-sectional area for bus-bars and bare connections; 750 amperes per sq. in. for purely current-carrying parts of switchgear; and 250 amperes per sq. in. for contact surfaces, give excellent results in freedom from heating at all movable and fixed mechanical joints, and at the same time ensure strong mechanical design.

The designing and choice of materials so as to obtain and maintain sufficient pressure between contacts is all-important in determining the useful life of a switch.

Now, in designing switchgear on the above lines, the question of "live hinge" or not is of no moment whatever, the only consideration is the question of heating, and I submit that a consulting engineer has no business whatever (if honestly considering the interests of his clients) to specify in what manner, or of what type, the switch shall be constructed. He is not a switch designer or manufacturer, and probably his only actual experience has been with paper switches of the single stroke pen type. It is quite possible to safeguard everybody's interest by specifying switches to be of strong mechanical design (and see that they are so when delivered), and to be free from abnormal heating when loaded as per specified conditions.

In conclusion, I would state without fear of contradiction from any responsible switchboard designer, that the finest switch ever designed is that originally introduced (I believe) by the British Thomson-Houston Co., and manufactured by the General Electric Co., of New York, and used on most of their traction boards. This switch has a "live hinge."

Knife.

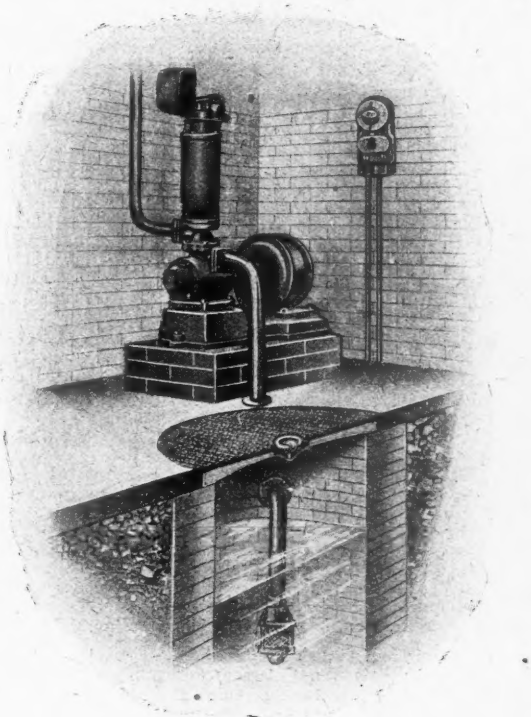
[To prevent misconception, we think it well to state that the writer of this letter is a well-known municipal engineer. —Eds. E.R.]

Factory Electrification.—The days are gone by when it was necessary to convert factory-owners and manufacturers to the advantages of electrical driving. It is practically generally recognised now that the electric motor offers advantages which no other form of driving can offer, and many steam and gas-driven factories are now being changed over to the electric drive, and very few new factories are put down on the old lines. Among the factories which are being at present equipped to the specifications of Mr. Frank Broadbent, who has specialised in the electrification of factories and workshops, are the following:—The Home and Colonial Stores tea and cocoa warehouses, which will take a supply for about 50 motors of various sizes, in addition to electric light, from the mains of the Shoreditch Vestry; W. P. Griffiths and Sons, Ltd., about 30 motors and lighting from the South London Electric Supply Co.; R. & R. Clark, Ltd., of Edinburgh, about 60 motors from the mains of the Corporation supply; and the *Nottingham Guardian*, lighting and power, from the Corporation supply.

ELECTRICITY AND SMALL WATER SUPPLIES.

A field of application of electrical energy which can be extended considerably, at any rate in this country, is the utilisation of electric power for supply of water to small isolated installations, such as country houses, &c. A good deal has, of course, been done by means of the ordinary plunger pump driven electrically, but a modern improvement which appears to be worthy of attention has recently been installed at the Seapatrick Mills, this being, we understand, the first installation of its kind in this country. It consists of a pump of the type shown in the illustration below, fitted with a small air chamber and automatic switch, and direct-coupled to an electric motor, the pump and motor being mounted on the same self-contained bedplate. The system is known as the Pitro, and this was installed by the Pittler Universal Rotary Machine Syndicate, Ltd., of London.

In this system, the air is compressed in the top of the air chamber to a predetermined pressure, when it actuates a small diaphragm. This throws out the automatic switch, and therefore cuts out the motor. When the pressure falls in the air chamber, due to water being drawn from the system, the reverse action



Automatic Electric Pumping Set.

occurs, the diaphragm being actuated by a spring. Hence the system is entirely automatic, and the motor only drives the pump when water is being drawn from the system.

The advantage of electric power in this connection is that an instant response is given to the demand for water, and therefore the necessity for a storage system such as a cistern is done away with. The advantage of this is obvious when it is remembered that such cisterns accumulate dirt, and harbour bacilli, thus tending to propagate illness and disease. The action of the motor-driven pump ensures a steady flow of water without any pulsation in the system. The pump itself is entirely enclosed, and runs practically noiselessly, without the vibration which is an unfortunate feature of a good many reciprocating pumps. Its steadiness in running, combined with the compactness of the arrangement, allows of a comparatively light foundation being adopted, and hence the cost of installation is comparatively low.

From the operating point of view, the action of the pump combines the good features of the piston pump, allowing the use of high pressures and a suction lift of up to 25 ft., with that of a centrifugal pump, in that it can be driven at a relatively high speed, and can, therefore, be directly coupled to an electric motor.

The moving parts of the pump itself are few in number and simple in construction, and as there are no valves the wear and tear and upkeep are extremely small. Pumps of this design have been in continuous operation for over two years, and have shown so little wear that they maintain their high overall efficiency. Owing to the special features of the design of this pump no stuffing boxes are required, as the internal pressure keeps it perfectly tight, and it is arranged in such a way that the water itself acts as a lubricant. Hence, attendance charges are cut down to the minimum. These sets are being built in a range of sizes capable of dealing with 325, 650, 1,100, 1,650, 2,200 and 3,000 gallons of water per hour, working against a pressure of 60 lb. per sq. in. or 130 ft. The power required for driving the pump under full-load working conditions ranges from ½ to 4 B.H.P., according to the size of the set, and the cost of running, taking the price of electrical energy at 1d. per unit, will be of the order of 1d. per 1,000 gallons pumped. It is, therefore, seen that the apparatus described constitutes a very real advance on some of the previously existing types of electrically-driven pumps, and is worth the consideration of electrical engineers who are interested in country house installations and similar work.

AN AUTOMATICALLY-OPERATED MINING LOCOMOTIVE.*

An accumulator locomotive which requires no driver, and which starts itself, stops itself and sets its own points automatically, has been in use for the past year and a half in a coal mine at Heydt, with very satisfactory results from the points of view of safety, economy and simplicity of operation.

Starting and stopping are effected by means of a wooden lever which projects well in front of the locomotive, through a slot. As soon as the locomotive meets any obstruction this lever is pushed in as far as the buffers, and so cuts off the electric supply, and, at the same time, connects the motor up as a dynamo and short-circuits it so as to act as a brake.

At the low speed adopted (viz, about 1 m. per second, or 2¼ miles per hour), this brake is able to pull up the locomotive and its train of trucks in a distance of about a yard. As soon as the obstruction is removed, the lever is forced out again slowly by a spring, and the locomotive starts again. The lever is so sensitive that even a person standing in front of the locomotive will serve to stop it. When the locomotive is required to run in the reverse direction the complete lever mechanism has simply to be swivelled round till the lever projects at the other end of the locomotive.

The locomotive is provided with a single 2-H.P. (continuous rating) totally enclosed shunt motor, geared to the wheels through double-reduction spur gear. Shunt winding was adopted in preference to series winding, to avoid the risk of the motor running away on down grades.

Thirty accumulator cells are carried, with a capacity of 72 ampere-hours, which is sufficient for a 6 or 7-mile journey. Charging takes place on sidings at the loading place of the trucks from a 220-volt D.C. supply, requiring 30 amperes for about three hours. A single attendant is able to change the batteries in from two to three minutes.

The weight of the complete locomotive is 2½ tons, its overall length, excluding the lever, is 7 ft. 8 in., breadth 2 ft. 10 in., and height 4 ft. In an 8-hour shift one locomotive can deal with about 40 useful ton-miles, the consumption being about ·27 KW.-hour per ton-mile.

The following figures show the average monthly results (averaged from the records for the months April to July, and excluding interest and sinking fund allowance):—Working days, 23; total useful ton-miles, 1,680; wages, £2 19s.; materials, 7s. 6d.; cost of current, 12s. 4d.; total cost, £3 18s. 10d.; cost for one ton-mile, ·57d.; average output for each locomotive in eight hours, 37 useful ton-miles.

Since the locomotive runs on a line with various points and crossings, these have to be automatically operated in any one of various predetermined ways by the locomotive itself. For this purpose several hooks are provided at each end of the loco.-frame, and into these hooks rings can be inserted which catch in lever arms projecting from the truck, and which actuate the points. The hooks are so arranged that each is directly over one particular point lever, so that by inserting rings only in certain hooks, the particular track to be followed by the train is predetermined.

Whilst a train is passing a crossing or points, a barrier is automatically raised a short distance away, which serves to prevent a second train approaching by operating its lever. As soon as the first train is through the crossing, the barrier drops, and the second train automatically starts itself again. Successive trains can follow one another as closely as desired, because there is no danger from collision since the trains stop as soon as any obstacle is reached and start again as soon as it is removed.

Diesel Engines.—According to reports appearing in several newspapers, Messrs. Harland & Wolff, Ltd., have sold to the Burmeister and Wain (Diesel System) Oil Engine Co., Ltd., London, the engineering and boiler-making shops at Glasgow, which previously belonged to the London and Glasgow Engineering and Iron Shipbuilding Co., and were acquired by Messrs. Harland & Wolff in February last. In future the works will be used solely for the manufacture of Diesel engines.

Hungary.—It is reported that new works for the manufacture of cables are about to be started in Buda-Pest by Messrs. Siemens & Halske.

* *E.T.Z.*, August 22nd 1912.

AUSTRALIAN TRAMWAY COMPANIES AND THEIR EMPLOYÉS.—VIII.

The long drawn-out dispute between the principal tramway authorities in Australia and their employés has advanced a further stage. Some of the companies have held conferences with the workers' Union, and, as a result, settlements satisfactory to both sides have been arrived at and approved by the Court. On the other hand, some of the companies have refused to meet the Union and are using every means in their power to fight the case. In order to obtain further evidence, and at the same time to allow negotiations as to the purchase of the Perth lines by the Western Australian Government to be completed, the Court has now adjourned *sine die*, and in the future will meet at Sydney, not at Melbourne as hitherto.

Acting on the advice of the Judge given at the sitting referred to in the last article, the Melbourne Tramway Co., employing some 1,500 persons, met the officials of the men's Union, and came to a definite agreement. The terms were very far from those claimed by them, but in many cases they were an advance on existing rates and, it was stated, would involve the company in an additional outlay of £75,000 a year. At a men's meeting called to consider the settlement, one of the speakers said it represented an increase of 14 per cent., while during recent years the cost of living had increased by at least 33 per cent. It is this salient fact which is responsible for the greater part of the industrial unrest in Australia at the present time.

Under the settlement, some of the principal new rates are :—Gripmen and conductors, first year 8s. 6d., second year 9s., afterwards 9s. 6d. per day ; extras when training students ; casual hands, 42s. per week guaranteed ; tunnel cleaners, 9s. per day ; shunters, 8s. 4d. per day ; car workers, 8s. 4d. per day ; engine drivers, first-class £4, second-class £3 15s. per week ; shed men (day, middle and night shifts), 10s. 6d. per day ; assistants (day, middle and night shifts), 8s. 6d. per day ; signalmen in charge of levers, 10s. per day ; track gangers in charge of road, 10s. 6d. per day ; track gangers in charge of men, 10s. per day ; track repairers, 9s. per day ; 'bus drivers, 9s. per day ; boiler cleaners, 8s. per day, and 6d. per hour extra when cleaning inside boilers ; labourers over 21, lavatory men, office porters and orderlies, 8s. per day.

Other conditions are these :—The week to consist of 48 hours, and overtime after eight hours' work to be paid for at time and a quarter, and afterwards time and a half. When a man does different classes of work during one shift, the highest rate of pay to be paid. All employés reporting themselves for Sunday duty to be given a full day's work at time and a quarter rate. Gripmen and conductors to be paid from time of signing on to signing off.

Pay at time and a quarter to be given for the following eight public holidays : Christmas Day, Boxing Day, New Year's Day, Good Friday, Easter Monday, Eight Hours' Day, King's Birthday and Foundation Day. Also ten days' annual holiday on full pay.

As regards disputes, a board of reference, consisting of one representative of the company, one of the men's union, with the Industrial Registrar as umpire, was appointed to deal with all disputes. In the case of offences charged against the men, they could be represented by an officer of their union.

Employés were to be allowed to wear their association badge on duty, and to post their notices on the company's notice boards.

These terms were granted by the company and accepted by the men, and while several points, such as the question of preference to unionists, were referred to the decision of the Judge, they appear to form a fair compromise on the matters in dispute.

This settlement practically disposed of the case against the Melbourne Co., which was accordingly indefinitely adjourned to permit of final signatures to the settlement being obtained. The North Melbourne Co. had a number of conferences, but they have not yet finally settled matters. They state that being a smaller company they cannot afford the same terms as the Melbourne Co. The men rely on a clause in the North Melbourne Co.'s working agreement with the municipal authorities, whereby they were bound by any arrangement made by the Melbourne Co. with its employés. It was pointed out that this clause did not contemplate the present position, and it was asked if the Judge, by a judicial settlement instead of a mutual agreement, could alter it. The Judge promised consideration of the point, but urged the parties to come to an agreement.

The negotiations in the cases of the Prahran and Malvern Tramway Trust and the Ballarat, Bendigo, Hobart and Fremantle systems were reported to the Judge as proceeding, but progress was very slow.

In the case of Adelaide, a rupture between the parties had taken place, but efforts were being made to renew negotiations. The Judge pointed out his anxiety to do all in his power to aid in a friendly settlement, and adjourned the cases indefinitely to enable the various points to be discussed between the parties.

The two cases left were Perth and Brisbane. As regards Perth, negotiations are proceeding between the company and the Western Australian Government as to possible purchase of the undertaking by the Council. The Judge adjourned this case to await developments, as in the event of the deal being concluded, there would be no need for further action on his part.

The Brisbane Tramways Co. refused to meet the men's Union, and submitted that there was no case against them on 15 grounds. The principal of these were that there was no dispute between their employés and themselves, and that if there were, the dispute did not extend beyond the State of Queensland, and consequently the Court had no jurisdiction. The company did not employ any of the members of the men's union, which was not an organisation within the Act, and as a tramway company was not an industry in respect of which an industrial dispute, extending beyond the limits of a State, could arise, therefore no organisation could be registered, and no proper parties were before the Court. Finally, the company submitted that as regarded the claim for preference to unionists, the Court had no power to make an award of preference.

The Judge reserved his decision on these points, and proceeded to listen to the evidence produced by the company. This largely consisted of the testimony of present employés of the company that they were satisfied with the existing conditions of service, and did not press the claims in the log presented by the men's Union. Mr. Myers, a conductor, once a member of the men's Union, explained his reasons for resignation, and the difficulty he experienced in getting the resignation accepted. Mr. Stevens, the traffic manager, gave detailed evidence as to the history of the company's dispute with the men's Union, the formation of the local Union, with the goodwill of the company, and the conditions of employment of the various grades. He opposed the men's claims for a minimum wage for casuals, to display their notices on the company's premises, and for the granting of preference to unionists.

At this point the company handed in a petition signed by 710 of their employés, stating they did not belong to the men's Union, and did not want to do so. The fight then centred on the manner in which these signatures were obtained, and by whom the petition was promoted. The company admitted that they had prepared the petition on the advice of their legal advisers, and also that all signatures were obtained in a magistrate's office, in the presence of a sergeant of police. Mr. Warton, on behalf of the men's Union, challenged a number of the signatures, and urged that many of the men signed under fear of the consequences of refusing.

The Judge ultimately decided to appoint his associate on the bench, a Commissioner, to proceed to Brisbane to take evidence from a number of the employés as to the conditions under which they were led to sign the petition, and also to find out why the 60 men were resigning from the men's Union. As the taking of this evidence would take some time, he would proceed with the case at some future time in Sydney. This adjournment would enable the proceedings to be brought in another Court to be argued before a full bench of Judges. He would also, if asked, state a case for the Superior Courts as to the wearing of the badge, including, if desired, the other defendants.

The whole matter is therefore, for a time, in abeyance.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

G.E.C. Interlocked Controller.

We illustrate herewith an interlocked control panel recently made by the General Electric Co., Ltd., for the control of variable-speed shunt-wound motors. The controller, which is of

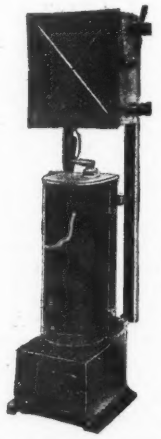


Fig. 1.—G.E.C. Interlocked Controller.

the drum type, is mounted on a cast-iron case, containing the shunt regulating resistance, the contacts for the latter being on a face-plate inside the controller case.

A "Salford" circuit-breaker, in a separate cast-iron case mounted above the controller, is electrically interlocked with the drum contacts so that it can only be closed when the controller handle is in the "off" position. Also, if the breaker trips, the controller handle must be brought to the "off" position before the circuit-breaker can be closed again.

The "K.K." Detector.

In our issue of July 5th, describing tests of the Railophone, we referred to the resonant relay invented by Mr. H. von Kramer and Dr. Kapp, upon which the working of the system depends. We are now

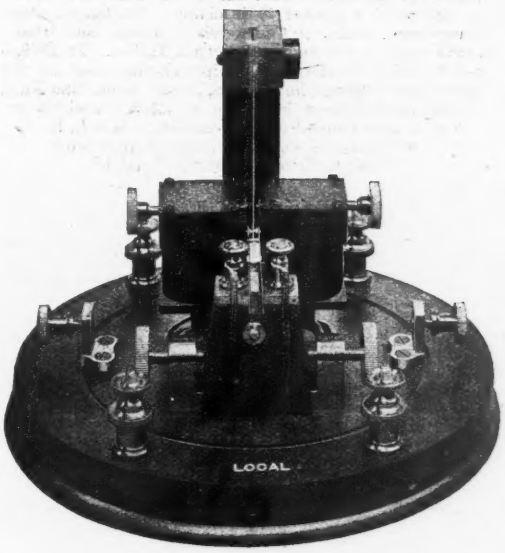


Fig. 2.—The "K.K." Detector.

enabled to illustrate the device, which is capable of responding to electromagnetic impulses producing by induction currents of the order of $\frac{1}{8}$ milliampere with an E.M.F. of about 20 millivolts, at 100 cycles per second, while remaining undisturbed by the mechanical vibrations met with on railway trains. The detector

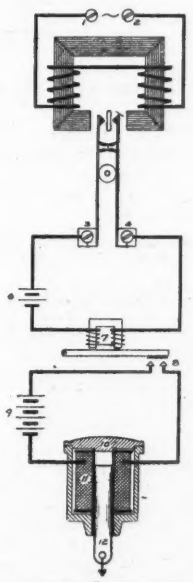


DIAGRAM OF "KK" DETECTOR
WITH SECONDARY RELAY OPERATING STEEL CLAD SOLENOID.

1, 2, terminals of receiving circuit; 3, 4, terminals carrying the contact reeds; 6, battery in secondary circuit, giving 0·1 ampere; 7, electro-magnet; 8, switch in operating circuit; 9, battery energising 11, operating solenoid, with steel yoke 10 and core 12.

Fig. 3.—Diagram of Connections of Detector and Operating Circuit.

consists essentially of a steel reed tuned to a natural frequency corresponding to that of the transmitting apparatus, and polarised by a steel permanent magnet, the free end of the reed resting normally midway between the poles of a laminated electromagnet energised by the receiving circuit (fig. 4). Thus, when a minute alternating current circulates through the windings of the magnet, the end of the reed is set in vibration, the amplitude increasing by virtue of resonance if the current is maintained. The vibrating reed is not directly utilised as a contact maker; it is mounted between two light reeds, which carry platinum contacts through which a local circuit is completed (fig. 3), and when the amplitude of vibration becomes great enough for the reed to strike and separate these supplementary reeds, this circuit is interrupted, allowing an electromagnet to drop its armature and close a local circuit. An ivory stop between the contact reeds prevents the latter from following one another when struck by the vibrating reed. The

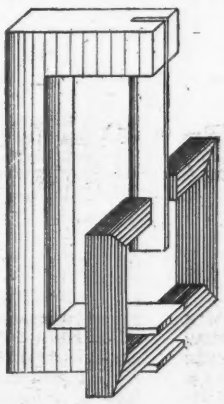


Fig. 4.—Magnet System of "K K." Detector.

instrument responds to a power of only four-millionths of a watt: the frequency to which it answers can readily be adjusted. The device can be adapted to a great variety of applications quite apart from its special use in the Railophone system, and is, it will be seen, a very clever invention.

The G.E.C. Breakfast Cooker.

The General Electric Co., Ltd., have introduced a specially designed breakfast cooker, which embodies several distinct uses. As a toaster, it quickly produces a crisp, golden-brown toast. As a hot plate it can be used for making coffee or tea, boiling eggs, &c. The pan or tray can be used for frying bacon, or, if the pan be inverted over the hot-plate, it can be employed as a girdle for baking scones, &c. The little overhead rack will keep the plates, toast and other things warm till required.

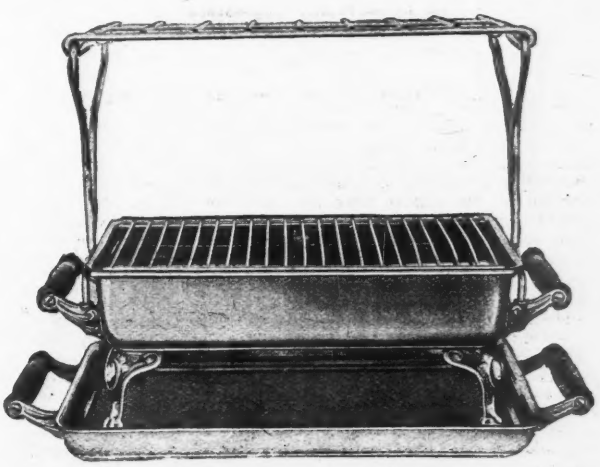


Fig. 5.—G.E.C. Breakfast Cooker.

The heating wires, though amply protected by a substantial guard, can be seen when they are glowing with heat. This adds greatly to the effective appearance of the stove, which is artistically designed, making it ornamental as well as useful.

The Siemens "Lumograd."

Messrs. Siemens Bros. Dynamo Works, Ltd., of Caxton House, S.W., are now placing upon the market a neat and compact portable instrument for the measurement of illumination, which reads directly in candle-feet. It is known as the Siemens "Lumograd," and is completely self-contained, there being no accessories except, where required, a tripod stand for the measurement of candle-feet at various angles. The standard lamp is run from a dry cell, thus eliminating trouble caused by accumulators. Each Siemens "Lumograd" is supplied with three glasses of different densities, by means of which readings may be made, covering a range from ·0625 to 8 candle-feet. The actual measurement of illumination is made by comparing the illuminations on both sides of a light-proof screen, one side being illuminated by the external source of light, and the other side by the standard lamp contained in the instrument. The latter is so arranged that it may be moved away from or closer to the screen, thus decreasing or increasing the illumination on the

lower side of the screen, until both sides are equally illuminated. This operation is accomplished by means of a thumb-screw attached to a toothed wheel and rack, whilst the pointer is fixed to the same shaft, and indicates on the dial the illumination value in candle-feet. The readings may be checked at intervals by setting up a lamp of

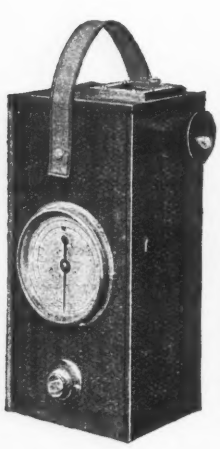


Fig. 6.—The Siemens "Lumograd."

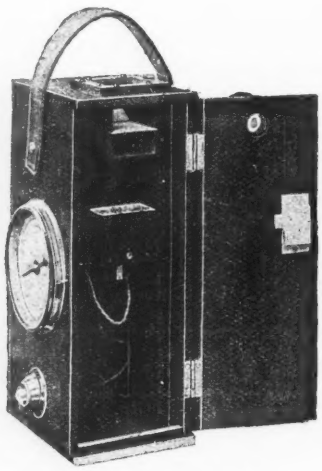


Fig. 7.—Interior of the "Lumograd."

known candle-power (preferably 1 or 2 c.p.), and placing the instrument so that the glass in the head of it is 1 ft. from the source of light. The reading can then be checked, and should it be found to be incorrect, a simple adjusting screw is provided, by means of which the correction can readily be made.

BUSINESS NOTES.

Bankruptcy Notices.—On Monday at Blackburn County Court a bankruptcy motion was heard arising out of the estate of John Wm. Garsden, electrical engineer, of 5, Hope Terrace, Blackburn. On behalf of Mrs. Anne Simpson, Birkenhead, one of the creditors, Mr. Gamon, of Liverpool, asked for an order that the decision of the trustee rejecting her claim against the estate should be reversed, and that the said claim should be admitted to rank for dividend for the full amount thereof. Mr. Gamon said that Garsden formerly carried on business as an electrical engineer in partnership with Samuel Lord and Wesley Sutton. That partnership continued until September, 1909. Prior to that date applicant had lent a considerable sum of money to the partnership. The partnership was dissolved, and the partnership assets, with the exception of the book debts, were transferred to a limited company, called the Howe Electrical Engineering Co. In June this year applicant recovered judgment against Garsden, and the two other partners. Then Garsden became bankrupt, and Mrs. Simpson put in proof in the ordinary formal way. The trustee rejected the proof on the ground that there were joint partners. He agreed that he could not prove in competition with the separate creditors of the Garsden estate unless he showed that there was no joint estate, and were no solvent partners. He claimed he could prove without receiving dividend until the separate creditors had been satisfied. Without proof he would be cut out of Court altogether. He had the right to prove, even if his rights were postponed. The trustee should have raised this question when dividend was being actually paid, and not have rejected the proof. Mr. Gamon's second point was that there were, in fact, no solvent partners, and no joint estate. Mr. Gamon produced the deed dissolving the partnership between Garsden, Sutton and Lord, which, he said, showed that there was no joint estate. The hearing was adjourned until December 2nd for the purpose of Mr. Gamon considering the position of the other two partners.

Thomas Topping, electrical and mechanical engineer, Southport. —October 13th is the last day for the receipt of proofs for dividend; Mr. E. D. Symond, receiver, 11, Dale Street, Liverpool.

Private Arrangements.—Charles Howard Egan (trading as C. H. Egan & Co.), electrical engineer, 21, Lincoln Place, Dublin.—A meeting of the creditors in the above matter was held recently, when a statement of affairs was submitted, showing liabilities totalling £3,288, all of which was due to unsecured creditors. There was one fully-secured creditor—viz., the Royal Bank of Ireland, Dublin, for £99 in respect of overdraft on current account. The assets were estimated to produce £1,302 net, and consisted of sundry debtors (£654), estimated to produce £565 uncompleted contracts, costs of materials and wages, £639; cash in hand, 11s. 7d.; stock in trade at cost, £96; two motor-cars and a motor-boat, £160; and tools and appliances, £34 12s., making a total of £1,496, from which had to be deducted £194 for claims of preference creditors and costs of arrangement. There were three policies of insurance on the life of the debtor, but these were held by the bankers against their claim. Mr. Egan is stated to have commenced trading in College Street in 1894, and from 1898 up till 1909 the firm was known as Egan & Tatlow. In 1909, however, a dissolution of the partnership took place, and on matters being gone into between the partners, it was found that Mr. Egan was indebted to the firm to the extent of £405, for which amount Mr. Tatlow is now scheduled as a creditor. Mrs. C. H. Egan is down as a creditor for £186, and it appears that the debtor lost about £500 in a Stock Exchange transaction and his wife realised some shares which she held, and reduced the balance to £230; her claim of £186 is in respect of the proceeds of the shares which she realised. With the exception of the claim by Mrs. L. G. Egan, the debtor's mother, the remainder of the liabilities are all for goods supplied. In regard to the assets and the item "uncompleted contracts," it is stated that there will be a certain amount of profit on the contracts when they are finished, but at the meeting the solicitor, appearing on behalf of the debtor, explained that a number of his contracts had resulted in a loss, and it was not possible to say exactly what profit would be made beyond the amount stated. The household furniture (£300) and office furniture (£50) were not set out in the statement as assets. The debtor made an offer of a composition of 6s. in the £, payable by instalments spread over 12 months, the last two to be secured; but the creditors would not accept this, and, after some discussion, the debtor proposed to pay a composition of 6s. 8d. in the £, and several of the creditors present expressed their willingness to accept this offer, the composition to be paid by instalments at three, six, nine and 12 months, the last two to be satisfactorily secured. The following are creditors:—

Tatlow, William	£405	Kenny & Co.	£43
Tudor Accumulator Co.	348	Curtis, W., & Sons	42
Solomons, E. M.	280	Littauer, J.	40
Egan, Mrs. C. H.	186	Birch, J.	24
Egan, Mrs. L. J.	176	Best & Lloyd, Ltd.	21
General Electric Co.	146	Waller & Co.	25
Hornsby, R., & Sons	139	Grevener, J. & H.	20
Brit. Ins. Cables, Ltd.	128	Murphy, H. W. G.	20
Veritys, Ltd.	110	Alliance Gas Co.	19
Booth Bros.	108	Miller & Beatty, Ltd.	17
Edison & Swan E.L. Co.	108	McCormick, W. O.	17
Newtons, Ltd.	100	Brooks, Thomas & Co., Ltd.	16
Crossley Bros., Ltd.	93	MacFarlane & Sons	16
Jandus Arc Lamp	80	London Electric Firm	17
L'Estrange & Hay	77	Brit. Thomson-Houston Co.	14
McDougall, J., Ltd.	75	Battersby & Co., Ltd.	16
Osler, F. & C., Ltd.	61	Proprietors, *Irish Field*	14
Prickard, Ltd.	44		

And sundry creditors for smaller amounts.

Hydro-Electric Work Abroad.—Amongst the orders received by Messrs. Boving & Co., Ltd., during the last two months are the under-mentioned:—

Water turbines, for the City of Kyoto, Japan.
Fujimi plant, three units of 1,100 h.p. under a head of 14·2 metres, and one exciter of 75 h.p.
Ebisugawa plant, one unit of 500 h.p. under a head of 3·1 metres.
For Cataguazes, Brazil, two units of 750 h.p. under 26 metres head, and two exciters of 66 h.p.
Six turbines of from 6 to 100 h.p. for Scotland, Japan and Brazil.
Orders for Victoria turbo-pumps include one 2,400-g.p.m. pump for the Kuala Lumpur Engineering Co.; one 350-g.p.m. pump for Wellington, N.Z.; four 1,000-g.p.m. pumps for Messrs. S. Pearson & Sons, Ltd.; and one for the Parkside Mining Co. (through the A.E.G. Electric Co., Newcastle-on-Tyne), to deliver 600-g.p.m. against a head of 900 ft.
Pipe-line orders include two welded pipe lines of 42-in. diameter, and each of a length of 2,778 ft., for the Kumamoto Hydro-Electric Co., Japan.

Dissolutions and Liquidations. — Institute of Wireless Telegraphy, Ltd.—This company is winding up voluntarily, with Mr. G. P. Taylor, 36, Spring Gardens, Manchester, as liquidator. A meeting of creditors is called for October 10th.

Pearson Fire Alarm, Ltd.—A meeting will be held at 67, Watling Street, E.C., on November 12th, to hear an account of the winding up from the liquidator, Mr. H. Wingfield.

Sparks & Williams, consulting engineers, 52, Queen Victoria Street, London, E.C.—Messrs. J. N. Sparks & A. E. Williams have dissolved partnership. Mr. Williams will attend to debts.

Messrs. H. Jaggar & Co., electrical engineers, Batley and Dewsbury.—Messrs. H. Jaggar and A. Brook have dissolved partnership. The stock, plant and other properties have been taken over by Mr. Brook, who is to continue trading as "A. Brook & Co."

Meldrum Bros., Ltd., Timperley, Manchester.—A first dividend of 2s. 6d. in the £ is payable at 3, York Street, Manchester.

Catalogues and Lists.—The Western Electric Co., Ltd., North Woolwich.—Eight-page booklet (No. 109), giving brief particulars with prices and illustrations of complete private telephone equipments for commercial and residential use; also a circular giving prices, &c., of Blake insulated staples.

The Attracta Electrical Co., 75, Fetter Lane, London, W.C.—Price leaflets of "Auto" mercury break flashers and "Attracta" arc lamps.

Messrs. Siemens Bros. & Co., Ltd., Woolwich.—A fine catalogue (No. 535) of over 80 pages, containing well-executed illustrations, descriptive information, prices and so forth, of a great variety of telephone apparatus, the material listed being restricted to articles in general use. The sections are: telephones and accessories, telephone switchboards, protective devices, condensers and these are followed by a telegraph code and index

Messrs. Falk, Stadelmann & Co., Ltd., 83-87, Farringdon Road, London, E.C.—36-page list (No. 348), in which they show, and state prices of, a variety of designs of their "Aureola" luminous electric radiators, convectors and Bastian heaters.

Messrs. Veritys, Ltd., 31, King Street, Covent Garden, London, W.C.—A batch of new publicity literature has been received. The largest item consists of a supplementary catalogue of electric supplies for shipbuilders. As a prefatory list shows, the firm have done a great deal of electrical apparatus business with H.M. Navy, and in this catalogue of 140 odd pages, which is excellently produced and most profusely illustrated, there are given particulars and prices of Aston steam dynamos, oil engine sets, motors, drills, hoists, pumps, fans, distribution boards, motor starters, searchlights, electric cooking and heating apparatus, electric light fittings and a host of other things intended for ship service. The other literature before us includes the following: No. 699—the "Aston" electric oven and other cooking apparatus; No. 691—"Three good points" concerning "Aston" electric radiators; No. 692—a folder showing numerous radiator designs; No. 702 (24 pages) dealing with "Aston" switchgear complying with the Factory Act Regulations; and a number of interesting little enclosure cards. While referring thus briefly to the company's present activities in regard to publications, we may add that they are now making at the above address an interesting display of their "Aston" radiators designed to harmonise with the various favourite periods of English decoration. The designs have been prepared with a thorough knowledge of each particular decade, and this is helped by the workmanship. Many of the details employed in the enrichment of these radiators have been taken from the actual work of Sheraton, Chippendale, &c. While ordinary electric radiators may be quite suitable for offices or more or less nondescript rooms, something different is required for the homes of the well-to-do, where harmony in decoration is desired. The firm invite an inspection of their display.

Messrs. Neville & Co., Midland Electrical Works, Bracebridge Street, Birmingham.—Lists showing a series of new patterns of luminous electric radiators. They vary from a simple design of two-light (almost featherweight) "Handy" radiator to very artistic forms. The "Corinthian" design, in polished brass, with fluted copper reflector, is exceptionally fine, and a four-lamp design, "The Belgrave," fitted with screens of crimson silk, strikes us as a novelty.

The Foster Engineering Co., Ltd., Wimbledon, S.W.—Four-page list containing illustrations, brief particulars, and prices of a new series of electric advertising signs. The "Zenith" arc lamp signs are supplied with either single or double screens or with screen and diffuser. In the last-named of these, the two side panels are opaque, only the centre panel transmitting the light of the lamp. The sign is pendant from two metal straps, allowing it to be used in conjunction with any arc or metal-filament lamp or gas fixture. Another sign shown is the "Aero," which, like the "Zenith," can have its sign plates changed as often as required. It is suited for shop-window and other similar service. The sign frame slips over the lampholder and is held in place by the shade ring. The "Aero" signs are supplied with either oxidised metal finish or in black enamel. It is claimed that these signs do not rob the lamp of its direct light, being illuminated by reflection. Other Foster signs are the "H 1" model, which shows the legend on the front plate in various colours, and the "J 1," which is a colour-changing sign, the variations in the tints being due entirely to the change in the view-point on the part of the onlooker.

Mr. C. Campart, 49, Newgate Street, London, E.C. (London office of the Anglo-Swiss H. Cuénod Construction Co.).—56-page catalogue containing a very fully illustrated description of the Thury regulator, its principle, working, speed of regulation, sensitiveness and advantages, and its principal applications. Regulation of D.C. generating units, A.C. regulators, automatic regulation of several generators running in parallel, automatic regulation for a three-wire system, regulation of feeders, automatic regulation of accumulator batteries, controlling mechanism, regulation of electric furnaces, and distant control—these are some of the sections in the book. A number of inquiry forms are given at the end of the book showing the particulars required. A separate 8-page list contains descriptive particulars of a high-speed automatic regulator. Among the chief advantages claimed for the regulator is its very high speed of operation, the time needed for the lever arm to pass from one extreme position to the other being from one to two seconds, or even less if required. This regulator has been developed for certain special cases where a very high speed of regulation is required, principally for voltage regulation of generators where the load variations are sudden and excessive. A test of this regulator is particularised, the results being shown by oscillograph curves.

The Synchronome Co., Ltd., 32 and 34, Clerkenwell Road, London, E.C.—Descriptive pamphlet and price list of 16 pages, relating to the company's electric clocks. The history of the system since it was introduced by Mr. F. Hope-Jones in 1895, is briefly mentioned, and the contact controlling pendulum time transmitter, and the dial movement, are shown. Tabulated prices appear of standard electrical impulse dials in wood and metal frames, also of turret clocks, and particulars of automatic time switches, astronomical regulator clocks, installations for ocean liners and for hotels.

Messrs. Davis & Timmins, Ltd., York Road, King's Cross, London, N.—70-page catalogue containing illustrations and tabulated sizes and prices of a large variety of Standard B.A. screws, and Standard Whitworth screws, with counter-sunk, cheese and other heads, with many different sizes of slots and pitches and diameters of threads. Prices are given per gross for brass and steel respectively. Some tables showing standard dimensions for screw heads and different threads, also decimal and millimetre equivalents are given.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., Blomfield Street, London Wall, London, E.C.—16-page art paper booklet entitled "A New Method of Electrical Installation," and describing the "Henley" wiring system and its possibilities. The letterpress is free from technical phrases, and is written to be of interest to the layman as well as to the electrical engineer. It fully describes the system, and is illustrated with interior and exterior photographs of a few of the installations recently carried out in buildings from large country mansions to small cottages. This system is now well established; it has been taken up by many of the largest contractors in the country, and is accepted by the leading fire offices. A number of copies of the booklet will be furnished to contractors for distribution on application.

The Interlock Metal Hose Co., River Park Road, Wood Green, London, N.—Ten-page pamphlet containing illustrated particulars and prices of their asbestos packed flexible metallic tubing for extra-high-pressures, steam gland connections, &c.; the "Dalmar" boiler tube sweeping apparatus is also shown.

The General Electric Co., Ltd., 67, Queen Victoria Street, London, E.C.—No. 6 Bulletin of 24 pages, containing a detailed and illustrated account of the "Angold" magazine flame arc lamps, particulars of tests of same, a list of spare parts, and night views of a number of public thoroughfares in different cities where these lamps are in service.

Mr. A. L. Pierce, Wallingford, Conn.—Illustrated leaflet relating to the Pierce tree insulator.

The Valor Co, Ltd., Aston Cross, Birmingham.—Folder relating to their "Fyrout" fire extinguisher.

The Invention and Novelty Exchange, 121, St. Stephen's Green, Dublin.—Illustrated leaflets describing the Imperial electric vacuum cleaner, the "Cadillac" suction cleaner, the "Paragon" lamp bracket and Williams's test clamps.

The British Thomson-Houston Co., Ltd., 77, Upper Thames Street, London, E.C.—The company have sent us a reproduction of their new showcard design. They have an extensive advertising campaign on foot for this season in the form of advertising, the issue of booklets, folders, price lists, and last, but not least, the showcard referred to above. In this, as in their last year's showcard, the company lay great emphasis on the strength and durability of the Mazda drawn-wire lamp. This quality is symbolised by the rock of Gibraltar, and a battleship in the foreground; while Mazda brilliance is indicated by the fact that the illumination on the side of the rock nearest the lamp is far more intense than that given by the sun on the other side. The "Sun's Only Rival" design has been retained in the new showcard, and is merged in the dominating "strength" conception, thus linking the new and the old designs, and maintaining a continuity of advertising policy. It is executed very effectively in nine colours. In addition to being employed in the form of showcards, postcards, and flashing signs, the Gibraltar design is also being used on the cover of the new Mazda lamp list, of which we have received a copy.

The Paragon Wire Mills, 10-12, Norman's Buildings, St. Luke's, London, E.C.—Price leaflet of silk and cotton-covered copper wires, also a card of specimens and prices of bell flexibles and wires and braided wires.

Advance in Prices.—The Adams Manufacturing Co., Ltd., of Bedford, announce an increase of 10 per cent. (before deducting the usual discounts) in all catalogue prices for Adams Igranic switchgear. The alteration takes effect from October 15th, and is due to continued rise in the price of raw material.

Austria.—The Schwechater Kabelfabrik of Messrs. Heinrich Eger & Co., of Schwechat, Lower Austria, has just been converted into a company with a capital of £20,000. It is proposed to extend the works and to put down a new plant for the manufacture of lead-covered cables.

Poland.—New electrical engineering works have just been started in Warsaw by the Polnische Elektrotechnischewerke "Siemens" Gesellschaft.

Book Notices.—*Engineering and Metallurgical Books*, 1907-11. By R. A. Peddie. London: Grafton & Co. Price 7s. 6d. net.—In these days of complexity, when multiplicity and diversity are the marks of every phase of civilisation, one hails with pleasure the advent of any means by which some degree of order may be attained and one's labours lightened. Amongst such aids to comfort, reference books deserve a very high place, particularly in a newspaper office; and the work before us, though admittedly incomplete, aims to fill up a wide gap in their ranks. We are continually being asked by our readers to recommend books on all kinds of electrical subjects, often on small sections of a subject that could by no means justify the publication of a book, and the bibliography now provided will be of great assistance in reminding us of the books available. So far, every book that we have looked up in it as a test has been found duly recorded; the titles are arranged under subject headings in alphabetical order, and there is also an index to authors' names and a table of subject headings. The compiler will be glad to receive particulars of books not included, to be published in the supplement for 1912, which, we are pleased to note, is already in preparation. The size, date, publisher and price of each book are given.

In the October number of *Scribner's Magazine* there are two excellently illustrated and interesting articles relating to the subject of railway terminal stations and their construction, lighting, motive power, &c. The terminal chiefly considered is the great new station in New York City of the Pennsylvania Railroad. Mr. W. Symes Richardson is the writer of "The Terminal—The Gate of the City," and Mr. Samuel O. Dunn, the editor of the

Railway Age Gazette, is responsible for "The Problem of the Modern Railway Terminal." These two contributions occupy a very large proportion of the number.

The *Motor Manual*. London: Temple Press. Price 1s. 6d. net.—Now in its fifteenth edition and 230th thousand, the *Motor Manual* is an established institution, whose popularity cannot be questioned. It is chock full of practical hints for motor-car drivers and owners, and we cannot imagine any garage completely equipped without a copy of this book.

How to Take Out Patents. By A. E. Edwards. Second Edition. London: Wyman & Sons. Price 2s.—This book is intended to fill the gap between purely technical works on patent law and popular treatises which afford little real assistance to the inventor; it covers both British and foreign patents, and besides defining a "patent," describes how it can be obtained, what can be patented, and what constitutes novelty. The construction of a sound specification is explained, and—most difficult problem of all—the methods of dealing profitably with patents are discussed. A large section is devoted to foreign and colonial patent law and procedure. The author's treatment of his subject is terse and lucid, and the book appears to be admirably adapted for the purpose for which it was written.

"*Journal* of the South African Institution of Engineers." Vol. XI, Nos. 1 and 2. August and September, 1912. Johannesburg: The Institution. Price 2s. each.

"Atti della Associazione Elettrotecnica Italiana." September 30th, 1912. Milan: Stucchi, Ceretti & C.

"Die Telephonie ohne Draht." By Dr. K. Markau. 1912. Brunswick: Vieweg & Sohn. Price M. 4.50.

"*Proceedings* of the Sydney University Engineering Society." 1911. Vol. XVI. Sydney: The Society.

"Calculs Techniques et Economiques des Lignes de Transport et de Distribution d'Energie Electrique." By C. Le Roy. Paris: Hermann et fils. Price 6 fr.

"*Boletin* de la Sociedad de Fomento Fabril." August, 1912. Santiago de Chile: The Society.

"*Proceedings* of the American Society of Civil Engineers." Vol. XXXVIII. No. 7. September, 1912. New York: The Society.

"Quarterly Trade Journal of the British Chamber of Commerce of Turkey." September, 1912. Constantinople: The Chamber. Price 2s. 6d.

The British Fire Prevention Committee has issued a further report (Red Book No. 171) on its series of glazing tests, this time in respect of three windows glazed with "Chadrac" electro-glazing, and submitted for review by Messrs Chater & Sons, London. Whilst up to the present the limit of fire-resisting glazing has been on a panel measuring 2 ft. × 2 ft., the panels here reported on are double the size—*i.e.* 4 ft. × 2 ft.—and this is certainly a remarkable achievement for glazing under fire tests for one hour at temperatures ranging up to 1,600° F., followed by the application of water from a steam fire engine at short range, tests which were passed with complete success.

Trade Announcements. — The Westinghouse-Cooper-Hewitt Co., Ltd., whose London offices and works were formerly situate at 151-2, Great Saffron Hill, London, E.C., have, consequent upon the growth and development of business, now removed to 80, York Road, King's Cross, London, N., to which address all communications should be forwarded. Their telephone number remains the same—"1647 City"—whilst under the recent postal concessions the telegraphic address now reads—"Hewittic, Kincross, London."

The Midland Electric Manufacturing Co., Ltd., have appointed Mr. H. J. Stanley, of 90, Deansgate, Manchester, to be their sole representative in Lancashire and Yorkshire from October 1st.

Messrs. Shalders & Davis, electricians, of Southampton, are, owing to the approaching demolition of the buildings, vacating their premises at 17, High Street.

The sole agency in Scotland for the sale of the prize-winning "Ceag" miners' electric lamp has been obtained by Messrs. Archibald Baird & Son, Ltd., Hamilton.

The "E.N.S." Electric Co. are equipping premises at Adderley Road, Saltley, Birmingham, for the manufacture of switches, fuse-boards and other electrical accessories, and hope shortly to be in a position to execute orders.

LIGHTING and POWER NOTES.

Accrington.—In connection with the proposed overhead lighting scheme, the work of installation is to be proceeded with forthwith, the electrical engineer being authorised to arrange for the wiring for 200-c.p. lamps, and Alderman Higham and the Mayor being empowered to obtain and decide the tenders for all the materials required. Provisional arrangements have been made for the taking of a site in Clayton-le-Moors for a transforming station.

Argentina.—The President of the French Bank of the River Plate requested the Buenos Ayres City Council to defer consideration of a petition at present before it for an electric light concession. He stated that he was acting on behalf of a Paris syndicate, which was interested in acquiring a similar concession, and the plans and full particulars were expected shortly.

Bangor (Co. Down).—The gas manager has been instructed to submit a report showing the cost of a small electric lighting plant, it being proposed to light the street electrically.

Barking.—The Council has informed Mr. W. Ivey, who desired to know whether an offer for the sale or leasing of the undertaking would be considered, that if an offer is submitted, it will receive attention.

In consequence of an anticipated loss on the undertaking, the charges for current for lighting have been increased from 4d. to 4½d. per unit, and for power by ½d. per unit on the scale charges.

Bath.—The Surveying Committee of the T.C. on Monday decided to convert 48 gas lamps in various streets to electricity. The cost of lighting will be the same as paid for gas, £2 10s. per lamp per annum.

Bedlington.—The Council has installed a comprehensive electric lighting scheme for the main highways from the station to West Sleekburn, Startford and Bornarsund. The current is supplied by the Bedlington Coal Co. from its power station at Bornarsund.

Blackburn.—The T.C. has confirmed a resolution of the Electricity Committee instructing the engineer to prepare a scheme for new electricity works, together with estimates, for submission to the Committee.

Bootle.—The agreement between the T.C. and Messrs. Harland & Wolff for the supply by the Corporation of electricity to the ship-repairing yard at North Docks for a period of five years from December 1st, 1912, was signed at a meeting of the T.C. on October 3rd. The terms of the agreement were not made public, but under the scheme the plant for distribution will be housed in a sub-station on Messrs. Harland & Wolff's premises, instead of at the Raleigh Street pumping station. The installation will include a 250-kw. rotary set, with transformer, switchgear and other apparatus, at an estimated cost of £1,500 (inclusive of £250 for a second transformer to existing rotary), and an alternative H.T.-feeder will be laid to the new works, at an estimated cost of £3,200 for a 500-kw. cable. The cable will be purchased out of the existing loan sanctioned for mains, but the £1,500 for new plant will be provided for out of a further loan to be sanctioned by the L.G.B. The original installation will comprise over 1,500 H.P., applied to motors for the most part operating tools on the individual-drive system, while the lighting will be carried out by flame arc lamps connected in groups on 220-volt circuits.

The T.C. has received the sanction of the L.G.B. to a loan of £41,919 for the erection of the new generating station at Marsh Lane to replace the existing power station at Pine Grove. The amounts of the loan are made up as follows:—£6,717 for purchase of land (60 years' period of repayment); £10,054 for erection of buildings and supply and fixing of weighbridge and steam piping (30 years); £19,735 for machinery (10 years); £1,263 for H.T. mains (25 years); and £4,150 for L.T. mains (20 years). Further works proposed to complete the undertaking amount to £6,694, and the L.G.B. has informed the Council that it will be prepared to entertain an application for sanction to a loan on the precise sum being ascertained.

Bradford.—On Wednesday last a third vertical Curtis turbine unit, of 4,500 kw. capacity, was started up at the Valley Road electricity works of the Corporation, by Alderman Hayhurst, in the presence of a large company, which included the chairman, Alderman Robinson, and members of the Electricity Committee. A luncheon was afterwards held at the Town Hall, when many of the local power-users were present. Including the previous Curtis turbine plant and four 1,000-kw. Corliss engine units, this station will now have a capacity of 14,500 kw. The station is provided with a Worthington base condenser and twin circulating pumps driven by a small Curtis turbine.

Burton-on-Trent.—An overhead H.T. three-phase main is to be erected from the electricity works to the pumping station, at a cost of £474, exclusive of distributing mains. In case the electrical engineer obtains another consumer about 1,000 yards further on, he has been authorised to erect this line at an estimated cost of £142. The public library and reading room is to be lighted with single-light fittings, instead of the present three-light ones, with 100-watt lamps and special "Holophane" reflectors, at a total cost of £18.

Canada.—The municipal telephone exchange at Fort William has been equipped throughout with electric radiators, totalling 73 kw., in sizes between 2½ kw. and 8 kw. No other form of heating is employed; the room temperatures required were 65° F. to 70° F., with a temperature of 40° below zero outside. It is recorded that no trouble has been experienced in keeping more than the required temperature during the 24 hours per day in which the building is in use, and as it uses current all day except for two hours of peak load, terms sufficiently favourable to enable it to compete with other forms of heating were obtained. The capacity of the plant is 1¾ watts per cb. ft.

The following powers have been conferred on the Ontario Hydro-Electric Commission by a Bill in the Ontario House to amend the Power Transmission Act:—

To take over existing power transmission lines and to improve water powers, by assisting municipalities and others in the storage of water, making of sluices, &c.

To expropriate a local distribution plant where a municipality has voted to enter into a contract with the Commission for a supply of power.

To regulate the installation of electrical equipment and installation of wires in all buildings, including private houses.

To require the appointment by municipalities of inspectors to see that such regulations are carried out.

To order the removal and alteration of any works that are a menace to the public safety or endanger life.

To control absolutely light and power rates charged by municipalities, whether they take power from the Commission or not.

To control the rates of any company or individual taking power from the Commission.

To prescribe a uniform system of book-keeping on the part of power municipalities.

To direct the disposal of surpluses earned by municipal power plants supplied by the Commission.

To order all wires under its jurisdiction underground in cities and towns.

With the co-operation of the Dominion Railway Commission to order underground all wires strung on streets where the municipalities construct tunnels or conduits to carry such wires.

To impose a penalty of $100 a day for any disobedience of any such order.

The above regulations are now law, and several cities are at present putting some of them into force.

Hamilton is endeavouring to have all the electric, telephone and telegraph wires in the city placed underground, and the companies affected are making a strenuous fight. Ottawa has also taken action to have all the wires on the principal streets placed underground.

Some of these regulations, however, impose a big expense on the various companies, and it may be difficult to carry, at least some of them, out.

Continental Notes.—Austria.—During the month of July last no fewer than 21 applications to utilise water-power for electrical purposes in various parts of Austria were received by the Hydrographische Central Bureau in Vienna.

Bohemia.—An electric power plant is being installed in the weaving mills of Messrs. Georg Löw, at Koniginhof.

Sweden.—The Uddeholm Co., of Uddeholm, who are adapting their plant at their Hagfors and Mykroppa works to the production of iron and steel by electricity, are putting down a large installation to utilise the Maltforsen Falls, on the River Ufar, about three miles from Hagfors, in the generation of the necessary electrical energy. It is stated that the capacity of the plant to be put down will be about 5,000 H.P.

Germany.—The Brandenburger Electricitätswerk Gesellschaft is the name of a new company which has just been formed in Brandenburg, with a capital of £50,000, to take over and carry on the municipal central electric lighting station in that town. The A.E.G. is interested in the new undertaking.

Norway.—A new power house has been completed at Flekkefjord, and will supply energy in part for systematic experiments in domestic electric heating by means of surplus energy in Swedish tile or fayence stoves, the same system being under test at Gottenburg, where stoves are heated up over-night, and used for heating purposes during the following 10 or 12 hours. Surplus electricity is used at Flekkefjord on a large scale for cooking during the day.

Cwmamman.—A representative meeting of ratepayers has decided by an overwhelming majority to recommend the Council to undertake an electric lighting scheme, at a cost of about £6,000. The Ammanford Gas Co. has extended its mains to the district, and has had trial gas lamps in use for about 12 months; it submitted two offers to the Council for the street lighting, 200 lamps being required, and the lower offer being equivalent to a 7¾d. rate. It is understood that the Council will install a suction gas plant and overhead mains, and that for street lighting alone the cost will not exceed the figure mentioned.

Cwmcarn.—At the new colliery here, as in the case of other collieries in the district, everything is driven electrically, there being no boiler on the ground. Energy is brought to the pit by overhead wires from the generating station at Abercarn.

Dalkey.—At the monthly meeting of the Urban Council, last week, a letter was received from Mr. W. A. Evans with reference to a company he was about to promote for the purpose of supplying electric light in Kingstown, Dalkey and Blackrock, stating that plans had been prepared setting out a scheme. He asked for the expression of the Council's opinion. The company would seek permission to open the roads in order to lay cables. The most economical scheme would be to get electric light from the tramway company, and if the three townships were to co-operate with the tramway company, the Dublin Corporation and the gas company could not prevent the tramway company from getting their Act of Parliament amended so as to enable them to supply electric light in Kingstown, Dalkey and Blackrock. It was pointed out that Kingstown had every facility for putting up a station at Dunleary, and could deliver spare energy, as Pembroke had proposed to do for Blackrock, at 2½d. per unit, leaving it to Dalkey to distribute it throughout the township. After some further discussion, it was decided to appoint a Committee and to ask Kingstown not to come to a decision as to the company's offer until an opportunity was afforded of discussing the matter with the Dalkey representatives, whose interests were so vitally affected.

Derby.—A L.G.B. inquiry was held on October 2nd into the application of the T.C. for a loan of £10,750 for electricity purposes. There was no opposition.

Dromore (Co. Down).—The Urban Council has decided to proceed with the scheme for the electric lighting of this town.

Dover.—The *Dover Express* contains a very lengthy report of a meeting of the Electricity Committee when a report on the estimated saving of £1,130 due to turning out the street lamps at midnight, was discussed. Apparently, the mayor and the chairman did all the talking, and eventually the report was approved. The local paper considers that the T.C. has utterly befogged itself over the lighting question, and it is somewhat difficult for the outsider to follow the various proposals made in view of the £3,254 net profit stated to have been made last year.

Dublin.—The Electricity Supply Committee of the Corporation last week issued its annual report and statement of accounts of the electricity undertaking for the year ending March 31st, 1912. The report states that after discharging all expenditure on the working of the undertaking for the 12 months, amounting to £49,034, and all capital charges amounting to £37,364, there remains a net profit on the year's working of £11,670. The income from private consumers for the 12 months amounted to £68,180, being an increase of £11,812 on the figure of the previous year, and the net surplus, after payment of the increased working expenses and the additional capital charges, shows an increase profit of £5,211 as compared with the previous year. The units sold for power purposes amounted to 6,724,000, and the cost of generation and distribution per unit, viz, 1·14d., shows a slight reduction of ·05d., and the capital charges of 1·13d. show a reduction of ·14d. per unit. The Council has already approved of the proposal of the Committee that out of the net profits of this year it should wipe out the last of the old debit balances of the undertaking. This will leave a credit balance of £4,672, which the Committee would have desired to bring forward to this year as a reserve. The Municipal Council, when considering the estimates on March 29th last, however, decided that out of the estimated profits of the current year a sum of £5,000 should be transferred to the relief of the rates, and as any charge of this kind must be met out of the actual cash balance, the decision of the Council wipes out the entire balance to the credit of the undertaking. In conclusion, the report stated that the Committee earnestly trusted that in dealing with the annual estimates of the Corporation in future, full consideration would be given to the really urgent necessity of a substantial reserve fund being built up in order that the undertaking might be developed in the manner in which the members of the Council themselves desired.

Dudley.—At the monthly meeting of the T.C. last week, the sale of the Corporation's electricity undertaking was again considered, on a resolution submitted by Councillor Adshead, to the following effect: "That the resolution passed last meeting authorising the sale be rescinded." The question was again fully discussed in all its bearings, and eventually the resolution was rejected by 22 votes to 4, so that the number of members of the Council in favour of the sale has greatly increased. Subsequently, at an open meeting of the Chamber of Commerce, a resolution was carried to the effect that the B. of T. and the L.G.B. be asked to withhold their sanction to the sale of the works until a public inquiry has been held.

Edinburgh.—The Public Parks Committee of the Corporation have considered the question of the lighting of the Calton Hill, and the electrical engineer has been asked to report on the matter.

Egypt.—Mr. Murdoch Macdonald, Under-Secretary for Public Works in Egypt, is investigating some of the artificial nitrate factories of Sweden in connection with the proposal to install a hydro-electric power station at Assouan.—*African Engineering.*

Ewell.—The Epsom U.D.C. has decided to proceed at once with the extension of the E.L. mains to Ewell, and to canvass the district for consumers.

Flaxton.—The R.D.C. has consented to the application of the York T.C. for permission to lay an E.L. cable at Heworth, which is outside the city.

Formosa.—An electricity generating station has recently been completed by the Japanese Government at Korisho, on the Island of Formosa. The water-power of the River Daian is utilised, the water being led along a canal until a fall of 130 ft. is obtained. Two turbines and dynamos, each of 500 H.P., have been installed, although only one is at present employed in supplying current for lighting and power purposes at Shoka and Taichu, the latter being the chief city in the centre of the island.

Gerrard's Cross.—The Uxbridge and District Electric Supply Co., in order to cope with the increased demand for current, is about to lay a trunk feeder at a pressure of 6,000 volts from Uxbridge to Gerrard's Cross and Beaconsfield. A new district will be tapped between the two places.

Gillingham (Kent).—The T.C. has applied to the L.G.B. for a loan of £6,615 for the installation of another Diesel engine at the E.L. works, as intimated in last week's Electrical Review.

The cables are to be extended to the works of Messrs. H. G. and W. Croneen, brick makers, who are installing a large motor.

Hazel Grove and Bramall (Cheshire).—The U.D.C. is considering the advisability of adopting electricity for street lighting purposes. Negotiations have been opened with the Stockport T.C. for a supply of current.

Hinckley.—The Leicestershire and Warwickshire Electric Power Co., Ltd., has applied to the B. of T. for permission to erect overhead lines for the transmission of energy at a pressure of 6,600 volts in the district outside Hinckley.

Hove.—As notice for the purchase of the undertaking of the E.L. company must be given not later than December next, the General Purposes Sub-Committee of the T.C. recommended that in the interests of the town it was desirable that the undertaking should pass into the hands of the Corporation. The General Purposes Committee on Monday endorsed the recommendation which was to be placed before the Council on Thursday, October 10th.

India. — Kashmir Hydro-Electric Scheme. — The Durbar are doing all they can to increase the load on this installation. Electric dredging of the river has produced some good results already, by giving a freer outlet to the surplus hill water which hitherto caused disastrous and frequent flooding of Srinagar. The lighting load for this city is steadily increasing, as the authorities are allowing special facilities for bazaar lighting and bungalows. A system of wiring has been instituted which gives every inducement to the poorer bazaar shop-keepers to use electric light in preference to any other.

The question of an electric railway between Srinagar and Rawalpindi has often been mooted, and the line must eventually come, but at present the Durbar do not feel justified in incurring such a large expenditure.

Leeds.—At the City Council on the 2nd inst., Ald. J. Clark, in moving the minutes of the Sanitary Committee, said that as a result of information obtained on visits to other towns as to refuse destructors and the utilisation of steam raised at destructors for the generation of electricity, the Committee recommended that a new destructor be erected as soon as possible, and that the surplus steam thus raised be utilised for the generation of electricity. They had four destructors, and an immense amount of heat escaped from the combustion chambers up the chimney and was absolutely wasted. If they could utilise all the heat that there was in the amount of domestic refuse destroyed during one year, and sell it to the Electricity Committee, it would bring in between £5,000 and £6,000 a year.

The City Council at its meeting last week decided, after a lengthy discussion, to refer back the proposal which had been brought forward by the Electricity Committee, that the Corporation should borrow the sum of £10,000 for the purpose of a scheme of establishing a department for the hiring out of electric motors. The active opposition of the local electrical trade to the proposal culminated in a deputation of engineers and electrical contractors attending the meeting to protest against the scheme, putting forward the views that, quite apart from the unfair competition with private traders, the Corporation, with the capital suggested, would not be able to provide a service equal to that which it would displace, and that, also, the Corporation would lose the services of privately employed canvassers who, under the existing system, have been pushing the sale of electricity by urging the public to make a more general use of electric plant. The traders are now to have a further opportunity of emphasising their protest before the Electricity Committee.

Mr. R. Armitage, M.P., said the Corporation had given private traders ample opportunity to supply motors on hire, but, practically speaking, nothing had been done, and nothing was being done by them; in fact, they themselves had told the Committee they did not want to encourage development along those lines, and there was only one firm in the city enthusiastic about it. The Committee's proposal was limited to the hire of motors. The department did not intend to do the installation and wiring; that would be done by contractors, who would thus have more work to do than they had had hitherto. The small trader would benefit by being able to hire a motor at a reasonable price.

Alderman Brown, chairman of the Tramways and Electricity Committee, said he believed there was a call for motors in the city, and he would like the Committee to ask contractors if they were prepared to lend out motors so that a man could have any make of motor he liked at a reasonable price. If motors could be hired at a reasonable price from private firms, he had no desire to press the proposal.

Leigh-on-Sea.—The U.D.C. has now decided to grant Mr. Speight, electrical engineer, an interview respecting his proposed application for a prov. order for electric light. At a recent meeting, as stated at the time in the Electrical Review, the Council declined to consider the matter with Mr. Speight.

Littleborough.—The ring frames at Messrs. Fothergill and Harvey's Greenvale Mills, Littleborough, are now being driven by electric motors installed by the A.E.G. Electric Co., Ltd., of Manchester. The innovation will be watched with interest by other local firms.

Llanfairfechan.—The Council has had under consideration a communication from Mr. W. R. Walton, consulting engineer, in reference to the water supply and electric lighting scheme. It was decided to call a special meeting of the Council to consider the question and to meet Mr. Walton.

London.—Southwark.—The accounts of the electricity undertaking show that during the year there was a net loss on the working of £443, which has been transferred to the renewals reserve account. The capital expenditure on the undertaking now amounts to £108,672, of which £7,042 was incurred during the last year, £4,208 being on new machinery. Of the capital expenditure £25,500 has been repaid. The total income, after deducting £215 for bad debts, discounts, &c., was £20,714, showing an increase over the previous year of £2,080. The total working expenses were £15,052. The gross profit on the year's working was £5,661, and this amount, which was a reduction on that of the previous year of £531, represented a return of 5¾ per cent. on the total capital outlay. From this gross profit was deducted £2,616 for interest on loans and repayment of capital. The engineer, Mr. D. M. Kinghorn, in his report, stated that the past year was one of which the effects would be felt for some time to come, the series of strikes having undoubtedly caused a very serious dislocation of the business. The result had been in fact extremely satisfactory, and constituted a record from a revenue point of view, but for the prices which had to be paid for coal. The net result was an increase in the coal cost of '104d. per unit, the highest figure for some years, and £1,895 greater than £3,990, the cost for the previous year. The total units sold were 2,209,826, as against 1,790,983 in the previous year. The average prices obtained were for private supply 2·57d.; public lighting, 2·46d.; and power, 1·03d. The accounts were agreed to.

Hackney.—The Electricity Committee, reporting on the position of the Council's works as regards the possibility of breakdowns due to fire, states that at the time the works were constructed every precaution known at the time to prevent or minimise the effects of a fire was adopted. The switchboard is of the cellular type, in which each switch, &c., is placed in an independent fireproof compartment. Where the cables come together under the switchboard special precautions have been taken. The cables are all lead-covered, and are laid on roller racks, so as to be guarded from injury. There are no joints whatever in these cables, and the terminal ends are placed in secure positions, where a short circuit in any one of them would not affect anything else. It cannot be certified that a burn-out would be impossible, but the Committee is confident that it would be most improbable. The only possible improvement here would be to substitute armoured cables. In the extension works which have recently been designed, combustible material has been practically eliminated, and the plant has been so arranged that each generating set is practically an independent source of supply. The switchboard will be of metal, brickwork, concrete and porcelain only, the cables will be lead-sheathed and copper-sheathed, and there will be so few of them that there will be no two cables so close together that a burn-out on one would affect another. A switchboard fire, or, indeed, any sort of fire, will be impossible. When these works and ring mains and sub-stations are completed, Hackney will have at least two entirely independent sources of supply under one management, which can be connected at the main works and at three distinct sub-stations; total failure of supply due to fire will then be impossible.

Islington.—At the last meeting of the Borough Council, a letter was read from the County of London Electric Supply Co., suggesting that, in view of the recent fire at the Council's electricity station, it might be worth the Council's while to again consider as to the advisability of taking, as a matter of insurance, a bulk supply from the company's mains, and offering to submit a more favourable quotation for such a supply than that submitted on a former occasion.

Westminster.—The Works Committee report that the period during which the City Council and the Westminster Electricity Supply Corporation, Ltd., are empowered to review the contract between them for the public lighting of the parish of St. George, Hanover Square, with a view to the improvement of the lighting, expires on the 17th inst. As negotiations for such improvement have not been completed, the company are to be approached with a view to the period being further extended for six months.

Lytham.—The Council on October 3rd passed a resolution authorising application to the B. of T. for provisional powers to supply electricity within the township.

North Berwick.—At a meeting of the T.C. on Friday last, a letter was read regarding the transfer of the agreement between the Council and Messrs. Crompton, regarding the supply of electric lighting to the burgh, to the North Berwick and District Electric Light and Power Co., Ltd. The Council approved of the transfer.

Queensbury (Yorks.).—Messrs. Bruce Peebles, Ltd., are supplying two 500-kw. three-phase turbo-alternators to the Black Dyke Mills (John Foster & Sons). These will be driven by Adamson-Rateau reducing type turbines at 3,000 r.p.m., and will supply 440-volt 50-cycle current for the mills.

Rochdale.—The E.L. Committee has agreed that specifications be prepared and tenders invited for a 1,000-kw. three-phase steam alternator, with the necessary foundations, condensers, pipe-work, &c., and that plans and estimates be prepared for further extensions of the engine and boiler houses, together with steam alternator, condensers, pipe-work, boilers, coal stores, elevators, also settling tank and other necessary plant, with a view to making application to the L.G.B. for sanction to borrow the necessary moneys.

Rochford.—By 21 votes to 14 the B.G. has rescinded the recent decision to have the workhouse premises lit by electricity, on the ground that the expenditure (£7,000 for heating and lighting) is excessive. The Board has appointed a Committee to invite certain firms to tender for the heating and lighting work.

Royston (near Barnsley).—The U.D.C. has under consideration a proposal to apply to the B. of T. for a prov. order for electricity supply. It is estimated that the cost of converting the system of lighting would be about £700. Representatives of the Council recently had an interview with Mr. Woodhouse, of the Yorkshire Electric Power Co., and it is suggested that a deputation should visit some township already lighted by the company where

all necessary information could be obtained. The question is to come up for further consideration at the meeting of the General Purposes Committee.

Rushden.—The Rushden and District Electric Supply Co., Ltd., has been formed, with a capital of £25,000, to supply electricity, under a prov. order obtained by Messrs. F. H. Thornton, B. Sampson and J. Clark, to Rushden, Higham Ferrers and Irthlingborough. The company hopes to give a supply of current by next summer.

St. Helens.—The T.C. has applied to the B. of T. for sanction to erect overhead lines in order to supply electricity to the works of the British Electric Detonator Co., Ltd.

St. Paul's Cray.—The Bromley R.D.C. has consented to the Chislehurst Electric Supply Co., Ltd., supplying consumers at St. Paul's Cray.

Sevenoaks.—At a meeting of the U.D.C. on October 1st it was reported that Messrs. Crompton & Co., to whom the Council proposes to transfer its E.L. order, had formed a company, and were completing negotiations for land for the generating station. The clerk stated that he hoped that within a few days the whole thing would be quite ready to go on.

Sheffield.—Instructions have been given the city engineer to report on the question of lighting by gas, electricity or otherwise the whole of the bandstands in the city, together with an estimate of the cost. It has been decided to light the reconstructed baths in Corporation Street with electricity.

South Africa.—Somerset East ratepayers have polled in favour of a proposed local electric lighting scheme which is to cost £8,000.

An electric lighting scheme for Stellenbosch prepared by Prof. Bohle has been adopted by the municipality, and full plans and specifications will shortly be made public.—*British and South African Export Gazette.*

The Johannesburg municipal authorities are about to purchase a large supply of electricity meters for new services which are being undertaken.—*British and South African Export Gazette.*

Stafford.—The Electricity Committee has decided that application be made to the L.G.B. for sanction to borrow the sum of £25,000, to cover the anticipated expenditure on the installation of mains and service cables during the next few years.

Stoke-on-Trent.—The L.G.B. has deferred consideration of an application for sanction to borrow £1,000 for electric wiring, motors, &c., for the new Mining and Potteries Institute, pending the receipt of further particulars.

Tunbridge Wells.—The T.C. has received from the L.G.B. sanction to loans of £2,000 for mains, £250 for sub-station pillars, £300 for transformers, and £350 for house services.

The B. of T. has given the Council permission to supply electricity for lighting to residences at Speldhurst.

Turton (Lancs.).—The U.D.C. is inquiring as to the cost of lighting certain additional roads in its jurisdiction.

U.S.A.—The city of Chicago has contracted for 10,000 street arc lamps for the sanitary district. The lamps are 10-ampere flame arcs, and burn 90 to 100 hours per trim.

Uruguay.—The Congress has commenced to discuss the Government Bill creating a monopoly of all electric light and power stations in the country.

Wakefield.—In connection with the electricity department of the Corporation, it has been decided that application be made to the L.G.B. for sanction to borrow £3,000 for mains, £500 for sub-stations, and £500 for transformers.

Walmer.—Mr. W. T. Pressland, of Westminster, has informed the U.D.C. that he intends applying to the B. of T. for a prov. order for electric lighting. There is an order already in force, and the promoters are formulating a scheme.

Watford.—The U.D.C. has applied to the R.D.C. for consent to its application for powers to supply electricity in the rural area in the parishes of Watford Rural and Sarratt. The R.D.C. has decided first to consult the Parish Councils affected.

Wednesbury.—The annual report of the Corporation's electric light undertaking has been issued, and is regarded as very favourable. The sales of electricity show a total increase of 216,568 units, which is considered satisfactory, and the report adds that it is clear that the output will soon reach 1,000,000 units sold. The financial results are given subject to correction, and show a gross profit on trading of £2,486, as compared with £2,141 last year, the net surplus on the year's working being £854, as compared with £583 in the previous year. The amount available for disposal is £1,619, as against £1,309. The gross profit has, it is stated, increased by nearly £350, which is also considered satisfactory

Woodbridge.—Mr. E. Charrington has approached the U.D.C. respecting the establishment of electricity works by a company formed to supply small towns and rural districts with electricity. He has informed the Council that the company would put down a small station in the town if the Council would undertake not to apply for a prov. order for 21 years, or support any other company. The Council has referred the matter to a Committee for consideration.

Worksop.—The U.D.C. has received from the L.G.B. sanction to loans of £2,926 for street mains and services, £840 for meters, and £294 for improved street lighting.

TRAMWAY and RAILWAY NOTES

Argentina.—In view of the fines imposed by the Province of Buenos Ayres on Messrs. Otto Francke & Co., concessionaires for an electric railway between La Plata and Buenos Ayres, for delay in commencing the work, the concessionaires appealed against the decision. The Department of Engineers, to whom the appeal was sent for report, state that the real reason why the work has not been commenced is solely that the necessary capital has not been obtained. The concessionaires maintained that the delay was due to the fact that they could not obtain the plans for the route from the Government.—*Review of the River Plate.*

The Paraná municipality has granted a concession for the installation of an electric tramway in that city.

The Electric Light Co., of Pergamino, has applied for a concession for electric tramways.

Australia.—It is stated that the decision of Mr. C. H. Merz, as regards the system of electric traction to be adopted in the case of the Melbourne Suburban Railway scheme, is in favour of H.T. direct current, with 1,500 volts on the trolley wire.

A report on an electric tramway system to connect Port Adelaide with Adelaide is being prepared by Mr. W. G. T. Goodman, general manager of the Tramways Trust.

Chester-le-Street.—The U.D.C. recently received a letter from the Gateshead and District Electric Tramways Co., Ltd., stating that the question of constructing an extension of its system from Low Fell to Chester-le-Street had been considered, but it was thought the prospective traffic would not justify the outlay. Instead, it had decided to run a regular service of motor-cars between the centres.

Continental Notes.—Russia.—The *Commercial and Industrial Gazette* (St. Petersburg) states that the electrical energy generated for working the St. Petersburg municipal tramways is inadequate, and that proposals have been put forward for enlarging the central electric generating station, and also for increasing the number of tramcars belonging to the system. The total cost is estimated at about £77,000.

Crewe.—A Committee of the Corporation has had under consideration a preliminary report by the electrical engineer respecting railless cars and motor-omnibuses, and has resolved that the chairman of the Committee (Alderman Briggs) and the electrical engineer be authorised to visit Leeds and Birmingham as early as possible and inspect the motor-omnibuses and railless cars in operation there.

Dunfermline.—In connection with the proposed new roadway between Dunfermline and Rosyth, there is a suggestion to have a double line of tramways, so that the workmen at the Naval Base may enjoy the advantages of Dunfermline's Carnegie Trust attractions. The matter has been before the Town Planning Committee.

Edinburgh.—After discussing the report of the burgh engineer regarding new tramway routes, the Tramway Committee of the T.C. last week agreed to recommend the Council to apply for Parliamentary powers to run motor-'buses on the suggested routes. At one time it seemed possible that Edinburgh would follow the example of Dundee and adopt the railless traction system, but although this proposal was advocated at the meeting, it was ultimately decided not to adopt it, there being a feeling against the introduction of another system into the city.

Elland.—The D.C. has decided to defer the question of the provision of tramways, but has approved of the calling of a ratepayers' meeting on the subject.

Glasgow.—At the last meeting of the T.C.'s Committee on Tramways, the general manager submitted demand notes for the municipal assessments for the current year on, *inter alia*, the tramway lines in the city, and pointed out that the assessments had been imposed on the full valuation of the said lines, notwithstanding that it had been decided this year in the King's Bench Division of the English Courts, in the case of a company who worked as one connected system a tramway and a light railway, that the tramway was "land used only as a railway constructed under the powers of an Act of Parliament," and for assessment purposes, consequently, liable to be assessed on only one-fourth of the valuation of the lines. An amendment was carried that an appeal be made to the Special Committee on

Objections to Assessments, and, if necessary, to the Sheriff, against the said assessments in so far as they were calculated on the full valuation of the lines.

Halifax.—At the monthly meeting of the T.C. on the 2nd inst., Alderman Morley objected to the agreements by the Tramways Committee with various local authorities, and to the extension of the period within which such local authorities could require the tramways now or hereafter to be worked by the Corporation within their districts. He considered it would give the Tramways Committee *carte blanche* power in regard to tramway matters. Alderman Thomson considered the terms of the resolution were too widely drawn, and he proposed the addition of the words "subject to every agreement being scheduled to the Bill proposed to be presented to Parliament by the Corporation during next Session." The Council approved of the additions to the resolution. Mr. Fawcett then moved that the Tramways and Electricity Committee be authorised to purchase a motor-omnibus for £830, and that the chairman be empowered to give an order later for two additional motor-omnibuses at a similar price. He said it was proposed to establish a service of motor-'buses from Halifax to Mount Tabor. The Committee proposed later to ascertain whether it would be justified in recommending the extension of the tramways to Stainland and Ripponden. The recommendation of the Tramways Committee was approved.

Horwich.—The Council, on October 3rd, received an application from Bolton T.C. for the refunding of three-fourths of the district rate paid on the tramlines in Horwich, in consequence of the Tottenham decision. The Clerk reported that the Tottenham Council was appealing to the House of Lords, and suggested that the matter be left over pending the result. This course was resolved upon.

Hull.—At the meeting of the Corporation Tramways Committee, on the 3rd inst., it was stated that the tramway extensions to Spring Bank West would be proceeded with after Hull Fair, and would be followed by extensions to Hessle Road and Pickering Park.

Leeds.—The City Council last week decided to apply for powers for tramway extensions, which will include the following routes on the railless system, which has proved very satisfactory in Leeds:—Guiseley to Otley, *viâ* Menston; Menston to Ilkley, *viâ* Burley-in-Wharfedale; Farnley to Drighlington; Rodley terminus to Calverley; Rodley terminus to Farsley and Stanningley; York Road terminus to Crossgates. At present there is no sign of active opposition by the districts concerned, although Ilkley and Burley, pleasure resorts, have expressed a preference for being left without a service.

It is understood that the Tramways Committee will shortly give consideration to the question of introducing ½d. fares on the tramway system in the residential suburbs of Headingley, Chapeltown and Roundhay, which are at present excepted from the privilege. The ½ mile for ½d. system, which has been in operation in other parts of Leeds for six or seven years, has served the purpose of a great many people who would not otherwise have used the cars, and in this way has provided an additional source of income to the Corporation.

Lincoln.—At the City Council meeting on the 1st inst., the chairman of the Electricity Committee said the question of tramway accommodation for parts of the city not now served was under consideration. Owing, however, to the cost of extending the present system, the Committee was inclined to favour the introduction of railless cars or petrol-driven 'buses.

Little Hulton.—Negotiations are proceeding between the Little Hulton District Council, the Farnworth D.C. and the South Lancashire Tramways Co., with the object of laying a tramway from Walkden to Little Hulton, and thence to Farnworth, making a seven miles' circular route. The proposed tramway would connect with the company's existing lines at Walkden and Farnworth.

Little Lever.—The Farnworth and Little Lever District Councils are asking the South Lancashire Tramways Co. to extend its tramways to Little Lever.

Llandaff.—It has been decided to call in Mr. J. B. Hamilton, Leeds, to report on a proposal for a railless traction service between Llandaff and Cardiff.

London.—The L.C.C. has applied to the B. of T. to sanction experiments with petrol-electric tramway cars on the route from Woolwich Free Ferry to Abbey Wood. The route has been electrified, but it is desired to test the new cars exhaustively.

Newcastle-on-Tyne.—A new route has just been completed, opening up the thickly populated area of Shieldfield and connecting it up with the pleasure resorts of Jesmond. The line was inspected by the members of the Tramways Committee and other members of the Corporation on the 3rd inst. Councillor J. H. Rodgers, in the course of a short speech, said they had two miles of track through Shieldfield, and with two junctions, one a double one, the total cost was less than £14,000. He said they would be calling considerably on the reserve fund—which now amounted to £104,670—during the next 12 months. The new electrical equipment was going to cost £16,800 and there was need for 30 more cars. They were awkwardly placed in Newcastle, as they had about 80 cars which would only negotiate three routes, and they would not negotiate the new route to Newburn. He thought the suggestion of the manager that they should convert 30 of the old bogie cars, at a cost of £10,000 at the most, was a good one; it would mean a saving probably of £9,000. The lines in Grainger Street, Shields Road and Northumberland Street would have to be relaid. Altogether he estimated the cost at from £45,000 to £50,000.

Royston (near Barnsley).—The U.D.C. has received a communication from the Barnsley Electric Traction Co., asking whether the Council has any licensing powers in respect of vehicles plying for hire in the district. It is stated that the company contemplates introducing a railless traction system.

Salford.—The Corporation has confirmed a proposal authorising the laying of a double tramway track in Radcliffe New Road, Whitefield, in lieu of the existing single track, at a cost to the Corporation of £350.

Thames Valley Electric Railways.—The clerk to the Teddington Council has been informed by the Central London Railway of its decision to apply for Parliamentary powers at an early date, to extend the railway into the Lower Thames Valley. The exact route proposed is not yet known.

TELEGRAPH and TELEPHONE NOTES.

Chile.—The new wireless station on Mocha Island has been opened.—*Review of the River Plate.*

Deferred Telegrams.—The system of deferred telegrams in plain language at half rates has been adopted by Uruguay, Argentina, the Western Telegraph Co. and the Central and South American Co., in connection with various countries.

Imperial Wireless System.—The debate on the Marconi agreement is to take place in the House of Commons today. The Postmaster-General intends to move that a Select Committee be appointed to investigate the circumstances connected with the negotiation and completion of the agreement, and to report thereupon, and whether the agreement is desirable and should be approved; the Committee to have power to send for persons, papers and records.

International Radiotelegraphic Convention.—The text of the Convention of London, together with the detailed service regulations for wireless telegraphy at sea, is printed in full in the *Journal Télégraphique* for September 25th, 1912.

New Cables.—The Telegraph Construction and Maintenance Co. has recently completed the laying of a cable between Alexandria and Gibraltar, providing direct communication between Alexandria and the head office of the Eastern Telegraph Co.

The German South American Telegraph Co. has begun to lay the new cable between Monrovia (in Liberia) and Togoland and the Cameroons, to provide independent communication between these Colonies and Germany.—*Board of Trade Journal.*

New Telephone Relay.—The *E.T.Z.* reports that a telephone relay has been invented by Mr. R. von Lieben, in the construction of which a kathode-ray tube plays an essential part.

The Poulsen System.—The Federal Telegraph Co., of San Francisco, has acquired the patent rights for the Poulsen system of wireless telegraphy in the United States and their dependencies, and will erect a large number of stations. It is claimed that messages can be transmitted and received at a speed of 400 words per minute. The company already possesses 14 stations on the Pacific Coast.—*Journal Télégraphique.*

Is is reported that Mr. A. G. Baxendale has resigned his appointment as manager of the Pacific Cable Board to take up the management of the Universal Radio Syndicate. In an interview with a *Morning Post* representative, Mr. Baxendale expressed his confidence in the Poulsen system. He believed that in less than a year's time the syndicate would be able to give the public a telegraphic service to Montreal which would compete seriously both in speed and accuracy with the existing cable service, and, while granting a rate of 3d. a word to the public (as compared with the 1s. at present in force), would yield a fair profit. If the Government required a demonstration of long-distance telegraphy by the Poulsen system, the syndicate would be prepared to give one across the Atlantic in the course of six or seven months.

The Titanic Memorial.—About £400 has been subscribed towards the memorial which is to be provided at Godalming in memory of Mr. J. G. Phillips, the Marconi operator who went down with the *Titanic;* a further £200 is needed.

London-Amsterdam Telephone.—Successful experiments have been carried out by the Post Office in telephoning from London to Amsterdam and Arnheim.

CONTRACTS OPEN and CLOSED.

OPEN.

Aldershot.—October 15th. Balancer and switchgear for the U.D.C. See "Official Notices" October 4th.

Australia.—South Australia.—October 22nd. Telephone switchboard at Port Adelaide, for the P.M.G.'s Department. See "Official Notices" September 13th.

October 23rd.—100 common-battery table telephones, for the P.M.G.'s Department. See "Official Notices" September 13th.

November 27th.—18 miles paper-insulated cable, 155,000 jointing sleeves, also switchboard cable (Scheduled 248). Office of High Commissioner for the Commonwealth, 72, Victoria Street, S.W.

December 17th. Three sections of common battery multiple switchboard and other equipment, for the P.M.G.'s Department. See "Official Notices" to-day.

Victoria.—October 22nd. Fourteen sections of common-battery multiple switchboard, for the P.M.G.'s department. See "Official Notices" September 13th.

October 22nd.—(*a*) 37,000 carbon filament lamps, and (*b*) insulated lead-covered copper cables, for the Melbourne City Council. See "Official Notices" October 4th.

November 12th.—Deputy P.M.G., Melbourne. 100 electrical registers. High Commissioner's Office in London.

November 19th.—One mercury vapour converter, for the P.M.G.'s Department. See "Official Notices" to-day. Also two batteries and a 4-K.V.A. single-phase transformer. High Commissioner in London.

Western Australia.—November 5th. Telephone switchboards to Stores Schedules 222 and 223, for the P.M.G.'s department, Perth. See "Official Notices" to-day.

Offers will be invited shortly for the supply of plant required in connection with the electric lighting of Jamestown (South Australia). Messrs. Lincolne & MacDougall, Melbourne, are consulting engineers.—*Tenders M. and E. Review.*

Austria.—Vienna.—October 24th. The Austrian State Railway authorities in Vienna are inviting tenders for an installation of electric lighting in the railway workshops and material stores at Gmurden.

Barrow-in-Furness.—October 29th. Electrical and steam plant, &c., in connection with the electricity works extensions, for the Corporation. See "Official Notices" to-day.

Bradford.—October 19th. The tramways department are inviting tenders for miscellaneous stores during the year ending December 31st, 1913. Specifications, &c., from Tramway Offices, 7, Hall Ings, Bradford, on payment of £1 1s., returnable.

Canada.—October 31st. One 500-B.H.P. Diesel engine, alternator, exciter, switchboard, tungsten street lighting apparatus. Specification will shortly be available at Board of Trade Commercial Intelligence Department in London.

France.—Dole.—October 26th. Supply and installation of a transformer and an electric motor. Particulars from the Sous-Intendance Militaire, Quartier Bernard, Dole (Jura).

Gillingham.—October 22nd. One 500-H.P. Diesel engine and alternator, for the Corporation. See "Official Notices" October 4th.

Great Western Railway.—October 14th. Stores for a year. See "Official Notices" September 27th.

Grimsby.—October 21st. Fine slack coal for a year, for the Corporation electricity department. Mr. W. A. Vignoles, Borough Electrical Engineer.

Knottingley.—October 12th. E.L. installation, new picture theatre. Lunn & Kaye, architects, 14, John William Street, Huddersfield.

London.—October 15th.—6,000 steel tires for driving wheels and 5,000 steel tires for pony wheels for electric tramcars for the L.C.C. for a period of 12 months. Chief Officer, L.C.C. Tramways, 62, Finsbury Pavement, E.C.

L.C.C.—October 15th. Installation of electric lighting, bells and telephones at the Highgate Secondary School, St. Pancras, N.W. See "Official Notices" October 4th.

Maidstone.—October 17th. Coal for a year for the Corporation electricity works. Borough Electrical Engineer, Fair Meadow.

Nottingham.—October 24th. The Tramways Committee is inviting tenders for (1) steel tramway poles; (2) malleable-iron pole fittings; (3) cast-iron pole fittings. Specifications and forms of tender (2s., returnable) from Mr. Arthur Brown, City Engineer, Guildhall, Nottingham.

Rio de Janeiro.—November 11th. Tenders to the Directoira Geral de Correios, Telegraphos e Illuminacão, Ministerio da Viação e Obras Publicas, Rio de Janeiro, for the construction and working of an overhead or underground telephone system designed to join up the cities of Rio de Janeiro and São Paulo. The concession will be for not more than 35 years, 5,000 milreis (about £335) to be deposited by way of guarantee with the Brazilian National Treasury. The adjudication will be decided on the percentage of royalty on gross receipts offered by the tenderer to the Brazilian Government. Local representation is necessary. The *Diario*, containing further particulars, may be seen at the Commercial Intelligence Branch of the Board of Trade, London, E.C.—*Board of Trade Journal.*

Rochdale.—October 23rd. Steam turbo-alternator, condensing plant and pipework, for the Corporation. See "Official Notices" to-day.

Rotherham.—October 16th. One 1,000-KW. steam turbo-alternator, condensing plant, piping, H.T. switchgear, &c., for the Corporation. See "Official Notices" October 4th.

Spain.—October 29th. The municipal authorities of Carballo (province of Coruna) are inviting tenders for the concession for the electric lighting of the town.

The municipal authorities of Mundaca (province of Vizcaya) have just invited tenders for the concession for the electric lighting of the town.

Tasmania.—The Mount Lyell Mining and Railway Co. are in the market for the supply of hydro-electric power plant and motor-driven centrifugal plant for the reduction works at Queenstown, Tasmania. Specifications, &c. (21s.) from the London office of the company (Palmerston House, Old Broad Street, E.C.).

Tonbridge.—October 28th. One 100-KW. Diesel engine and generator, and alterations and additions to switchboard, for the U.D.C. See "Official Notices" to-day.

Watford.—October 15th. One 500-KW. steam alternator and a switchboard machine panel for the U.D.C. See "Official Notices" September 27th.

CLOSED.

Aberdeen.—The Tramways Committee, after considering tenders for six double-deck "P.A.Y.E." cars, recommended the Council to accept the offer of the British Westinghouse Electric and Manufacturing Co. for the electrical equipments. In regard to the car-bodies, a local offer (J. T. Clark & Co., Ltd.) was £102 higher than one by the Brush Electrical Engineering Co. On these offers the voting was equal, and it was decided to leave the matter to the Council to settle.

Accrington.—The Electricity Sub-Committee has accepted the following tenders:—

British Thomson-Houston Co., Ltd.—Switchgear (Clayton-le-Moors sub-station), £43.
Ferranti, Ltd.—Switchgear (Albert Mill supply), £41.

Australia.—Hopetoun and Beulah, Victoria.—The Reason Manufacturing Co., Ltd., has received from these two towns their contracts for electrolytic meters.

Sydney.—According to *Tenders (M. and E. Review)*, the Council has placed orders as follows:—

Ferranti, Ltd.—D.C. electric meters, 10, 25, 50 and 150-amp., £1,965.
Australian General Electric Co.—S.P. electric meters, 5-amp., £212.
B.I. & Helsby Cables, Ltd.—Cables, £355.
W. G. Watson & Co., Ltd.—Reason maximum demand indicators, £612.
Union Electric Co. of Australia, Ltd.—"Excello" arc lamps, £324.

Melbourne.—P.M.G.:—

I.-R., G.-P. & T. Works, Co., Ltd.—1,000 earth-plates, £342.
Commonwealth Art Pottery Co.—6,200 porcelain insulators, £129.
Holden & Lewis,—650 cast-iron covers and frames for manholes, £2,112.
Theodore Zwicker & Co.—10 tons sal-ammoniac crystals, £325.
Siemens Bros. Dynamo Works, Ltd.—Voltmeters and other instruments.

Australian Mining Standard.

Blackburn.—The T.C. has approved of a contract with the Wigan Coal and Iron Co. for the supply of steam coal for the Electricity Department.

Blackpool.—The Corporation has accepted the tender of Messrs. J. W. Fielding & Co. for installing an intercommunication telephone system at the gas works.

The Tramways and Electricity Committee has accepted the tender of Messrs. Walter Scott, Ltd (Leeds Steel Works) for 100 tons of tram rails.

Bootle.—Under the scheme for the new works, the Corporation has decided to order from Messrs. G. & J. Weir, Ltd., a feed pump, at £74; from the Rees Roturbo Co., a patent rotary feed pump, at £142; five new Hopkinson main steam valves, from Messrs. Hopkinson & Son, Ltd., at £94; and from Messrs. Brown, Duncan & Co., steelwork for turbine foundations, £105, and steelwork for switchboard gallery, to include staircase, £121.

Tenders for the supply of plant have been accepted by the Corporation as follows:—

British Thomson-Houston Co.—Supply of 250-KW. rotary and transformer, £677; high-tension switchgear, £349; low-tension switchgear, £170; erection of high-tension gear, £27.
British Electric Transformer Co.—Supply of 250-KW. transformer for existing rotary, £270.

The tender of the Northern Electrical and Ventilating Co., Ltd., of Liverpool, for the maintenance of the telephone system for 12 months has been accepted by the Corporation Hospital Committee.

Bradford.—The Corporation Tramways Committee has accepted the following tenders:—

J. Sagar & Co., Ltd.—Wood-working machinery for use at Thornbury car works, £262.
Siemens Bros. Dynamo Works, Ltd.—Motors, resistances and current breakers, £5,889.
Dick, Kerr & Co., Ltd.—Controllers, £1,152.
Phœnix Dynamo Manufacturing Co., Ltd.—300-KW. rotary converter at Thornbury sub-station, £798.

The Corporation has placed a contract for an electrical installation at Esholt Hall with Messrs. A. Ridgway & Co., at £166.

Bridlington.—The T.C. has accepted the tender of Messrs. Sidney & Co. for ¾ pea slack Haigh Moor Beanshaw coal for the electricity Works, at 13s. 9d. per ton.

Croydon.—The T.C. has received the following tenders for a lift for the Town Hall :—

Easton Lift Co.	£118
Waygoods, Ltd.	135
Smith, Major & Stevens	149
Otis Elevator Co.	213

Dartford.—The U.D.C. has accepted the tender of Messrs. E. J. & W. Goldsmith, Ltd., for 2,400 tons of Aberpergwm anthracite rubbly culm coal for the electricity works, at 15s. 7d. per ton.

Germany.—The Prussian State Railway authorities have lately placed an order with Messrs. Brown, Boveri & Co., of Mannheim, for two 1,200-H.P. electric locomotives, for the haulage of goods trains on the Lauban-Konigszelt railway.

Gloucester.—The T.C. has accepted the tender of Messrs. Wm. Cory & Son, Ltd., for rough small steam coal for the electricity works, at 10s. 8d. per ton.

Halifax.—The Guardians have placed an order for electrical fittings for the workhouse and hospital for six months ending March 31st, 1913, with Messrs. S. Hodgson & Co.

Huddersfield.—For installing the electric light at the new premises of the West Yorkshire Bank, Ltd., Market Place, the tender of Messrs. Garton & Son has been accepted.

London.—ISLINGTON.—The B.C. has accepted the tender of Messrs. Richardsons, Westgarth & Co., Ltd., at £14,708, for a turbine and condenser of their own manufacture, coupled to a Westinghouse alternator.

HAMMERSMITH.—The following tenders have been accepted by the B.C. for annual supplies of coal to the electricity department :—

Cory Bros. & Co.—Notts. Gedling. 12s. 5d. per ton.
Harrison, Tidswell & Co.—Notts. Bedstone main, 12s. 2d. per ton.
Myers, Rose & Co.—Notts. Gedling, 12s. 1d. per ton.

Maidenhead.—The T.C. has accepted the tender of Messrs. Tangyes, Ltd., of Birmingham, for a motor and pump, at £50.

Newcastle-on-Tyne.—The City Council on the 2nd inst. sealed a contract with Messrs. C. A. Parsons & Co. for the supply of a new turbo-alternator, at £7,049.

Newport (Mon.).—The T.C. has accepted the following tenders :—

Babcock & Wilcox, Ltd.—Boiler, superheater, &c., £1,530; and ash conveying plant, bunkers, &c., £590.
Underfeed Stoker Co., Ltd.—Stoker, £229.
Matthews & Yates, Ltd.—Forced and induced draught plant. £334.
Coal for the electricity works.—James & Emmanuel, Ltd. (3,250 tons); Partridge, Jones & Co. (3,250 tons); and Stephenson, Clarke & Co. (6,000 tons).

Shipley.—The U.D.C. has accepted the tender of the Western Electric Co. for high-pressure cables subject to a guarantee as to the maintenance for five years, in preference to a lower tender for Continental cable. The Council has also accepted the tender of Messrs. Sutton & Co. for cable ducts, at £645 ; and that of the General Electric Co. for machinery for Dockfield Works, at £1,046.

Sunderland.—The T.C. on Wednesday accepted the following tenders recommended by the Electricity and Lighting Committee :—

H. E. Pitt.—Air shaft for Hylton Road generating station.
Cox-Walkers, Ltd.—Regulator for turbine.
Falkirk Iron Co.—Brackets for arc lamp.
Drake & Gorham.—Cast-iron bases.
Ferranti, Ltd.—Meters.

Torquay.—The T.C. has accepted the tender of the British Thomson-Houston Co., Ltd., for a turbo-alternator, &c., at £5,458.

Worthing.—Acting on the recommendation of the Electricity Committee, the T.C. has accepted the tender of Messrs. F. A. Greene (London) for switchboard extensions, at £85, and that of the Callender's Cable and Construction Co., Ltd., for cable work, at £1,046. The following were the other tenders received :—

SWITCHBOARD EXTENSIONS.

Cox-Walkers, Ltd.	£90
Switchgear & Cowans	101

CABLE WORK.

Western Electric Co.	£1,106
Johnson & Phillips, Ltd.	1,118
British Insulated and Helsby Cables, Ltd.	1,120
W. T. Henley's Telegraph Works, Ltd.	1,121
W. T. Glover & Co., Ltd.	1,126
Siemens Bros. & Co., Ltd.	1,149

FORTHCOMING EVENTS.

Institution of Post Office Electrical Engineers (Metropolitan Centre).—Monday, October 4th. At 6 p.m. At the I.E.E. Paper on "Correct Time," by Mr. R. Myles Hook.

North of England Institute of Mining and Mechanical Engineers.—Saturday, October 12th. At 2 p.m. At the Wood Memorial Hall, Newcastle. Papers on "The Ignition of Coal-Gas and Methane by Momentary Electric Arcs," by Prof. W. M. Thornton, and "Electrically-Driven Winding Engines in South Africa," by Mr. A. W. Brown.

Electro-Harmonic Society.—Friday, October 18th. At the King's Hall, Holborn Restaurant. Smoking concert.

Engineering and Machinery Exhibition.—At Olympia. Daily to October 26th.

NOTES.

The 'Bus and the Road: A Hackney Report.—Mr. Norman Scorgie, the borough engineer, in a report to the Works and General Purposes Committee of the B.C., deals with the extra cost of maintenance of roads within the borough since the advent of motor traffic. Dealing with seven typical wood-paved roads, constructed between 1897 and 1903, he finds that the total cost of maintenance during 1906-9, was £258 ; 1909-12, £3,141 ; and for the period April 1st to August 31st, 1912, £813. Statistics bearing on five roads in the borough show, as an average of two days' record, that the 'buses varied from 724 to 1,346 in the period 8 a.m. to 10 p.m., and other mechanically-propelled vehicles varied similarly from 270 to 509. Eight 'bus services traverse the borough, and four have termini in the borough. Mr. Scorgie says that such extensive services, coupled with the other traffic, must continue to have a very injurious effect on the roads; in nearly every case where repairs have been found necessary by reason of sinkages, it has been due not to surface wear, but to disintegration of the concrete foundations. Considerable extra expenditure was incurred in repairing macadam roads in the same way. Mr. Scorgie deals with the question of the accumulated petrol tax, pointing out the unfair treatment of the London Councils in its appropriation. He estimates that 2,202,520 'bus-miles per annum are run in the borough, which at 3d. per 'bus-mile (equal to the tax), represents £2,750 per annum, derived from vehicles there, which should go towards the repair of roads in the borough.

Indentures Cancelled.—Messrs. D. Napier & Son, Ltd., of Acton Vale, at Acton Petty Sessions on October 4th, summoned Mr. R. J. Hammond, of Regent's Park, and his son, Ernest R. G. Hammond, the first named as the person liable under an indenture of apprenticeship for the good conduct of his son, and the latter as the party with whom a dispute had arisen.

Mr. Curtis Bennett, barrister, remarking that the summonses were a little out of the ordinary, said that the Bench could order the payment of damages, or rescind the contract entered into. The indenture was executed in April, 1909, the father being bound for the good behaviour of his son, who undertook diligently to serve the complainants. For a considerable period he worked quite well, and no fault could be found, but for some little time now he had neglected his work. In the first year he received 9s. a week of 54 hours, and in the fourth 16s. It was also open to apprentices to increase those amounts by piecework. From July of last year the son had not earned 16s. a week, and there had been a loss of over £14 on his work. The father was written to, and he saw Mr. Schofield, the firm's accountant, and subsequently, as no improvement was made, it was decided to bring the case to the notice of the Bench. There was no question whatever as to the son's ability, but evidently he had made up his mind to do as little as he could.

Evidence was then called.

Mr. Schofield said that on the average, apprentices could earn about 40 per cent. extra on their wages.

Hammond, jun., said he did not agree with this statement.

Mr. Schofield replied that some did earn less ; that was about 2 per cent. of the total number of apprentices—over 200. There was no other apprentice who had acted like Hammond.

Wm. Sugden, demonstrator, said that Hammond took a long time over his work ; and John Rhodes, foreman, said he was told by defendant that he did not intend following the trade when his time had expired.

Defendant alleged that he was neglected, and had to pick up what he could. Certain work he was not shown how to do.

Alderman Geo. Wright, J.P., chairman of the Bench, said that defendant's conduct had been very bad indeed. He had, moreover, acted very foolishly in his own interests, as with a satisfactory record from a firm of such high standing as Napier & Son, he would have been able to get a job anywhere. The indenture would be cancelled, and as no damages were asked for, the summons against the father would be dismissed.

Lightning Conductors for Trees.—It has recently been suggested that lightning conductors should be fitted to trees, if not to all those of timber value, at least to those which by their beauty or rarity deserve preservation. The conductor should consist of a simple galvanised iron, or preferably copper, wire of about ¼ in. diameter, carried from a branch in the upper part of the tree down the trunk, and after encircling the latter two or three times, driven into the ground. Special protection would thus, it is claimed, be given to the trunk, which is usually the seat of vital injury ; the spiral turns allow automatically for the growth of the tree, and thus the conductor, which is cheap to install, requires negligible maintenance. We may point out, however, that the spiral round the trunk would have a detrimental effect, as its inductance would compel the lightning to leave the wire. A better plan would be to bend the wire in a ziz-zag alongside the trunk. It is necessary to ensure thoroughly reliable contact between the earth and the lower part of the conductor. The latter should be carried away from buildings or roads and should terminate in a metal plate buried in damp soil. In the case of trees near buildings or in spots frequented by man or animals, a larger conductor section is desirable, and special care must be taken to ensure permanently efficient earthing. It should be remembered that the most severe storms will very probably occur when the ground is parched by a previous drought.

(*Continued on page* 585.)

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Bridlington.—The T.C. has accepted the tender of Messrs. Sidney & Co. for ¾ pea slack Haigh Moor Beanshaw coal for the electricity Works, at 13s. 9d. per ton.

Croydon.—The T.C. has received the following tenders for a lift for the Town Hall :—

Easton Lift Co.	£118
Waygoods, Ltd.	135
Smith, Major & Stevens	149
Otis Elevator Co.	213

Dartford.—The U.D.C. has accepted the tender of Messrs. E. J. & W. Goldsmith, Ltd., for 2,400 tons of Aberpergwm anthracite rubbly culm coal for the electricity works, at 15s. 7d. per ton.

Germany.—The Prussian State Railway authorities have lately placed an order with Messrs. Brown, Boveri & Co., of Mannheim, for two 1,200-H.P. electric locomotives, for the haulage of goods trains on the Lauban-Konigszelt railway.

Gloucester.—The T.C. has accepted the tender of Messrs. Wm. Cory & Son, Ltd., for rough small steam coal for the electricity works, at 10s. 8d. per ton.

Halifax.—The Guardians have placed an order for electrical fittings for the workhouse and hospital for six months ending March 31st, 1913, with Messrs. S. Hodgson & Co.

Huddersfield.—For installing the electric light at the new premises of the West Yorkshire Bank, Ltd., Market Place, the tender of Messrs. Garton & Son has been accepted.

London.—Islington.—The B.C. has accepted the tender of Messrs. Richardsons, Westgarth & Co., Ltd., at £14,708, for a turbine and condenser of their own manufacture, coupled to a Westinghouse alternator.

Hammersmith.—The following tenders have been accepted by the B.C. for annual supplies of coal to the electricity department :—

Cory Bros. & Co.—Notts. Gedling, 12s. 5d. per ton.
Harrison, Tidswell & Co.—Notts. Bedstone main, 12s. 3d. per ton.
Myers, Rose & Co.—Notts. Gedling, 12s. 1d. per ton.

Maidenhead.—The T.C. has accepted the tender of Messrs. Tangyes, Ltd., of Birmingham, for a motor and pump, at £50.

Newcastle-on-Tyne.—The City Council on the 2nd inst. sealed a contract with Messrs. C. A. Parsons & Co. for the supply of a new turbo-alternator, at £7,049.

Newport (Mon.).—The T.C. has accepted the following tenders :—

Babcock & Wilcox, Ltd.—Boiler, superheater, &c., £1,530; and ash conveying plant, bunkers, &c., £590.
Underfeed Stoker Co., Ltd.—Stoker, £222.
Matthews & Yates, Ltd.—Forced and induced draught plant, £334.
Coal for the electricity works.—James & Emmanuel, Ltd. (3,250 tons); Partridge, Jones & Co. (3,250 tons); and Stephenson, Clarke & Co. (6,000 tons).

Shipley.—The U.D.C. has accepted the tender of the Western Electric Co. for high-pressure cables subject to a guarantee as to the maintenance for five years, in preference to a lower tender for Continental cable. The Council has also accepted the tender of Messrs. Sutton & Co. for cable ducts, at £645 ; and that of the General Electric Co. for machinery for Dockfield Works, at £1,046.

Sunderland.—The T.C. on Wednesday accepted the following tenders recommended by the Electricity and Lighting Committee :—

H. E. Pitt.—Air shaft for Hylton Road generating station.
Cox-Walkers, Ltd.—Regulator for turbine.
Falkirk Iron Co.—Brackets for arc lamp.
Drake & Gorham.—Cast-iron bases.
Ferranti, Ltd.—Meters.

Torquay.—The T.C. has accepted the tender of the British Thomson-Houston Co., Ltd., for a turbo-alternator, &c., at £5,458.

Worthing.—Acting on the recommendation of the Electricity Committee, the T.C. has accepted the tender of Messrs. F. A. Greene (London) for switchboard extensions, at £85, and that of the Callender's Cable and Construction Co., Ltd., for cable work, at £1,046. The following were the other tenders received :—

Switchboard Extensions.

Cox-Walkers, Ltd.	£90
Switchgear & Cowans	101

Cable Work.

Western Electric Co.	£1,106
Johnson & Phillips, Ltd.	1,118
British Insulated and Helsby Cables, Ltd.	1,120
W. T. Henley's Telegraph Works, Ltd.	1,121
W. T. Glover & Co., Ltd.	1,126
Siemens Bros. & Co., Ltd.	1,149

FORTHCOMING EVENTS.

Institution of Post Office Electrical Engineers (Metropolitan Centre).—Monday, October 4th. At 6 p.m. At the I.E.E. Paper on "Correct Time," by Mr. R. Myles Hook.

North of England Institute of Mining and Mechanical Engineers.—Saturday, October 12th. At 2 p.m. At the Wood Memorial Hall, Newcastle. Papers on "The Ignition of Coal-Gas and Methane by Momentary Electric Arcs," by Prof. W. M. Thornton, and "Electrically-Driven Winding Engines in South Africa," by Mr. A. W. Brown.

Electro-Harmonic Society.—Friday, October 18th. At the King's Hall, Holborn Restaurant. Smoking concert.

Engineering and Machinery Exhibition.—At Olympia. Daily to October 26th.

NOTES.

The 'Bus and the Road: A Hackney Report.—Mr. Norman Scorgie, the borough engineer, in a report to the Works and General Purposes Committee of the B.C., deals with the extra cost of maintenance of roads within the borough since the advent of motor traffic. Dealing with seven typical wood-paved roads, constructed between 1897 and 1903, he finds that the total cost of maintenance during 1906-9, was £258 ; 1909-12, £3,141 ; and for the period April 1st to August 31st, 1912, £813. Statistics bearing on five roads in the borough show, as an average of two days' record, that the 'buses varied from 724 to 1,346 in the period 8 a.m. to 10 p.m., and other mechanically-propelled vehicles varied similarly from 270 to 509. Eight 'bus services traverse the borough, and four have termini in the borough. Mr. Scorgie says that such extensive services, coupled with the other traffic, must continue to have a very injurious effect on the roads; in nearly every case where repairs have been found necessary by reason of sinkages, it has been due not to surface wear, but to disintegration of the concrete foundations. Considerable extra expenditure was incurred in repairing macadam roads in the same way. Mr. Scorgie deals with the question of the accumulated petrol tax, pointing out the unfair treatment of the London Councils in its appropriation. He estimates that 2,202,520 'bus-miles per annum are run in the borough, which at 3d. per 'bus-mile (equal to the tax), represents £2,750 per annum, derived from vehicles there, which should go towards the repair of roads in the borough.

Indentures Cancelled.—Messrs. D. Napier & Son, Ltd., of Acton Vale, at Acton Petty Sessions on October 4th, summoned Mr. R. J. Hammond, of Regent's Park, and his son, Ernest R. G. Hammond, the first named as the person liable under an indenture of apprenticeship for the good conduct of his son, and the latter as the party with whom a dispute had arisen.

Mr. Curtis Bennett, barrister, remarking that the summonses were a little out of the ordinary, said that the Bench could order the payment of damages, or rescind the contract entered into. The indenture was executed in April, 1909, the father being bound for the good behaviour of his son, who undertook diligently to serve the complainants. For a considerable period he worked quite well, and no fault could be found, but for some little time now he had neglected his work. In the first year he received 9s. a week of 54 hours, and in the fourth 16s. It was also open to apprentices to increase those amounts by piecework. From July of last year the son had not earned 16s. a week, and there had been a loss of over £14 on his work. The father was written to, and he saw Mr. Schofield, the firm's accountant, and subsequently, as no improvement was made, it was decided to bring the case to the notice of the Bench. There was no question whatever as to the son's ability, but evidently he had made up his mind to do as little as he could.

Evidence was then called.

Mr. Schofield said that on the average, apprentices could earn about 40 per cent. extra on their wages.

Hammond, jun., said he did not agree with this statement.

Mr. Schofield replied that some did earn less ; that was about 2 per cent. of the total number of apprentices—over 200. There was no other apprentice who had acted like Hammond.

Wm. Sugden, demonstrator, said that Hammond took a long time over his work ; and John Rhodes, foreman, said he was told by defendant that he did not intend following the trade when his time had expired.

Defendant alleged that he was neglected, and had to pick up what he could. Certain work he was not shown how to do.

Alderman Geo. Wright, J.P., chairman of the Bench, said that defendant's conduct had been very bad indeed. He had, moreover, acted very foolishly in his own interests, as with a satisfactory record from a firm of such high standing as Napier & Son, he would have been able to get a job anywhere. The indenture would be cancelled, and as no damages were asked for, the summons against the father would be dismissed.

Lightning Conductors for Trees.—It has recently been suggested that lightning conductors should be fitted to trees, if not to all those of timber value, at least to those which by their beauty or rarity deserve preservation. The conductor should consist of a simple galvanised iron, or preferably copper, wire of about ¼ in. diameter, carried from a branch in the upper part of the tree down the trunk, and after encircling the latter two or three times, driven into the ground. Special protection would thus, it is claimed, be given to the trunk, which is usually the seat of vital injury ; the spiral turns allow automatically for the growth of the tree, and thus the conductor, which is cheap to install, requires negligible maintenance. We may point out, however, that the spiral round the trunk would have a detrimental effect, as its inductance would compel the lightning to leave the wire. A better plan would be to bend the wire in a ziz-zag alongside the trunk. It is necessary to ensure thoroughly reliable contact between the earth and the lower part of the conductor. The latter should be carried away from buildings or roads and should terminate in a metal plate buried in damp soil. In the case of trees near buildings or in spots frequented by man or animals, a larger conductor section is desirable, and special care must be taken to ensure permanently efficient earthing. It should be remembered that the most severe storms will very probably occur when the ground is parched by a previous drought.

(*Continued on page* 585.)

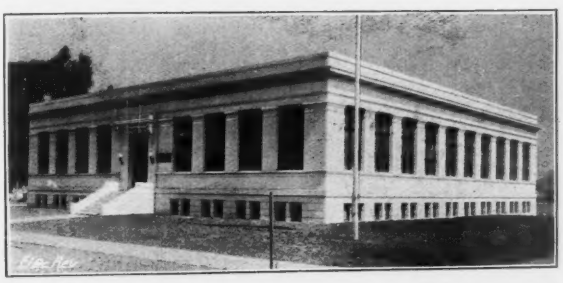
A MODEL FIRE-ALARM STATION.

A FIRE-ALARM central station which is a model of construction, efficiency and architectural beauty has been installed in Oakland, California, where it occupies space in one of the local parks. The building itself is an ornament to the city, a low, one-story edifice with a deep basement, of a severely classic design. It is built of a creamy Utah sandstone, with metal doors and window frames, concrete roofs and floors and a wainscot of Vermont marble. Thus it will be observed that it is fireproof, and therefore the city is not in danger of being left without protection by reason of a conflagration in its fire-alarm department. Formerly this was not the case, for the system was installed in a loft over an engine house, and it would have been a very serious matter for the city if that wooden building had happened to catch fire.

An interesting fact in connection with the equipment of this station is that the electrical apparatus was installed by the Electrical Department of Oakland, under the supervision of the city electrician, George R. Babcock. This was not only a guarantee that the work would be properly and efficiently done, but it resulted in a thorough familiarity on the part of the department's employés with the delicate and intricate mechanism, so that in making future changes or repairs, no outside assistance would be required.

With the population of the city approaching the 200,000 mark, and with prospect of its going far beyond that, as western cities have a habit of expanding rapidly, the station was designed to admit of additions and changes without altering the building or existing cable systems.

A roomy and well-lighted workshop occupies about a third of the main floor, which is a saving of both money and time to the city, and in the case of emergency repair work, is invaluable.



THE OAKLAND CENTRAL FIRE-ALARM STATION.

BATTERIES INSTALLED IN THE BASEMENT.

Here may be found the equipment of a modern machine shop with shaping machines, drill presses, lathes, emery wheels and milling machines, and the department is able to turn out such complex devices for its needs as automatic lighting switches, police boxes, fire boxes, tape registers, horse releases, &c., with the assurance that they are properly constructed.

The basement is occupied by the storage battery which is mounted on a system of metal racks. Both glass and porcelain insulation is provided. All the wiring is in conduit, including wires from battery to board, and shows only at the battery terminals. The basement floor is provided with trap doors so that any part of the room may be reached from any other part without cutting the floors; this is to provide for changes in the conduit system which may be needed in future years.

The large and attractive main room has an indirect system of illumination, the last word in electric lighting; and as the walls, ceiling and floors are white or light in tone, the reflected rays are diffused and softened, giving ample light without glare.

RECEIVING AND REGISTERING INSTRUMENTS, OAKLAND FIRE-ALARM STATION.

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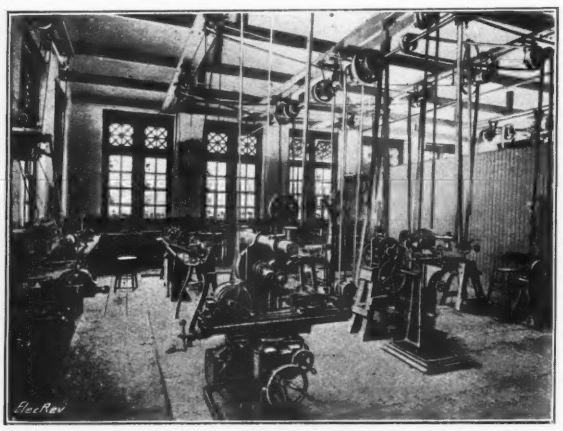
In this room are the delicate and complicated instruments for receiving and registering the alarms. The fire alarm equipment, as described in a report by the city electrician, consists of four 12-circuit main line storage battery slate-base panels, mounted on steel frames, and so wired that the



Workshop, Oakland Fire-Alarm Station.

office may be operated either manually or automatically. "When automatically operated, two repeaters take up the alarm from the fire box and transmit it to the engine houses through gong lines. The latter are connected in series through each repeater, the operating table, the manual transmitter and the gong panel to the engine houses.

"For manual operation both the box and the gong lines are brought to the relay and tape registering table shown in the illustration. Here the box circuits are connected to the closed-circuit tape machines and relays. Blinker lights are provided to flash their warning to the operator should his attention be distracted from any cause, and a telegraph key permits him to signal on the box lines whenever that becomes necessary. The gong lines are also connected with keys on this table. One line passes through a master tape and time-registering machine, which not only punches the number of the alarm, but also at the same time records the time of sending the alarm to the engine houses. When the apparatus is to be operated by hand, the automatic repeaters are switched off and the gong lines are operated either through the manual transmitter or the keys on the relay and tape-register table. In addition to the regular gong lines, high speed tapper lines are provided, to be used principally for reporting engines out or returned to service, and they are also used to signal fires. A two-dial, four-plate manual transmitter with which both gong and tapper lines are connected, gives perfect control of this service. Thus the engine houses may be signalled by the repeater, by the keys on the table, or by the manual transmitter.

"The use of the tapper lines is further seen in the operation at the engine houses. The alarm, whether sent out automatically or manually, is there received first on the tapper line at a high rate of speed as a preliminary warning and registered on a tape, and is followed closely by the alarm on the gong line given much more slowly. Companies that are not to respond to an alarm signalled by the tapper shut off the gong line, and all the subsidiary apparatus, so that the sleeping men and the horses may not be unnecessarily disturbed, but the man on watch stands ready to get a possible second or third alarm that then must sound on the gong and send the company out."

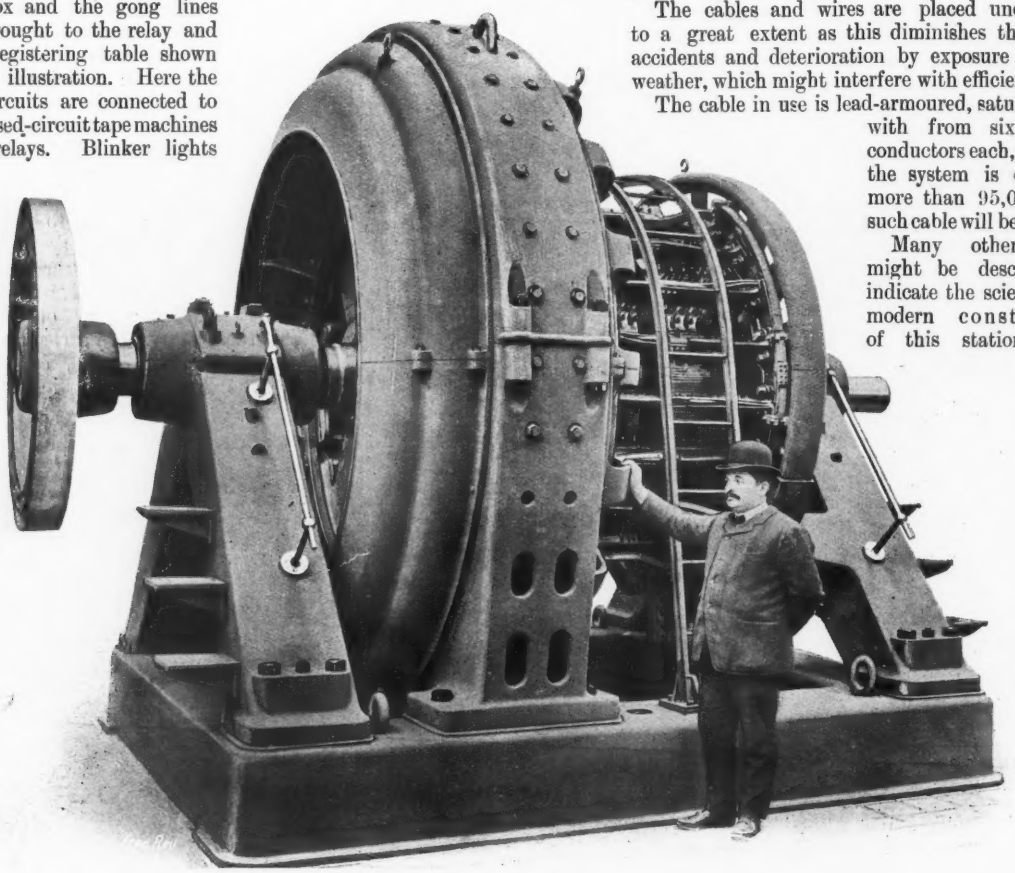
By use of the manual system it is possible to transmit the alarms rapidly to the central office and thence to the engine houses, keeping the lines clear for following calls, which in a city of considerable size often come in rapid sequence.

A private exchange telephone board of large capacity is also in operation to handle the alarms sent in by 'phone, and this is connected with the lines of both the local companies. It is equipped with red lamps which flash out to call the operator's attention.

The cables and wires are placed underground to a great extent as this diminishes the risk of accidents and deterioration by exposure to rough weather, which might interfere with efficient service.

The cable in use is lead-armoured, saturated core with from six to 180 conductors each, and when the system is completed more than 95,000 ft. of such cable will be installed.

Many other details might be described to indicate the scientific and modern construction of this station, which seems to have been planned with unusual forethought and skill, and which is remarkable not only in being adequate for the present needs but for the ease with which its capacity may be increased to meet the expansion of the rapidly growing city.



A Large Oerlikon Direct-Current Generator for Electro-Chemical Work (page 581).

LARGE DIRECT-CURRENT GENERATORS FOR ELECTROCHEMICAL PURPOSES.

[BY OUR BERLIN CORRESPONDENT.]

THE advantageous results obtained in connection with their machinery induced the Aluminium Industrie, Ltd., of Neuhausen, to entrust the Oerlikon Machine Works with the construction of two large direct-current generators intended for an extension of their works at Chippis (Valais). These machines, by their output, speed and dimensions, are among the most remarkable direct-current generators ever constructed.

The three generators were designed to meet the following requirements:—

Normal output, 2,650 KW.; power consumption with normal operation, 3,850 H.P.; output, 7,800 amperes at 340 volts, and 300 R.P.M.

The speed was determined by the water head existing at the place of installation; the generators were further to comply with the following conditions:—

1. A permanent overload capacity of 3,000 KW.
2. An overload capacity of 25 per cent. during two hours, of which 10 per cent. corresponds to the pressure and 15 per cent. to the current.
3. An overload capacity of 50 per cent. during half an hour, 10 to 15 per cent. corresponding to the pressure and 40 to 35 per cent. to the current.
4. An increase in the speed to 1·8 times its normal value (540 R.P.M.), the strain on the material not exceeding half the elastic limit.
5. A guaranteed efficiency of 94·5 per cent. and 93 per cent., as determined from measurements of the various losses, at full and half load respectively.

The maximum increase in temperature on full load, with day and night operation, was fixed at 45° C.

Actual tests have shown all these requirements to be complied with. These machines seem to be not only the first ever designed for the relatively high speed of 300 R.P.M., with the outputs and current stated, but the largest, as far as their output is concerned, of any machines so far constructed for electrochemical purposes. This is the more remarkable seeing that the current is collected from a single commutator.

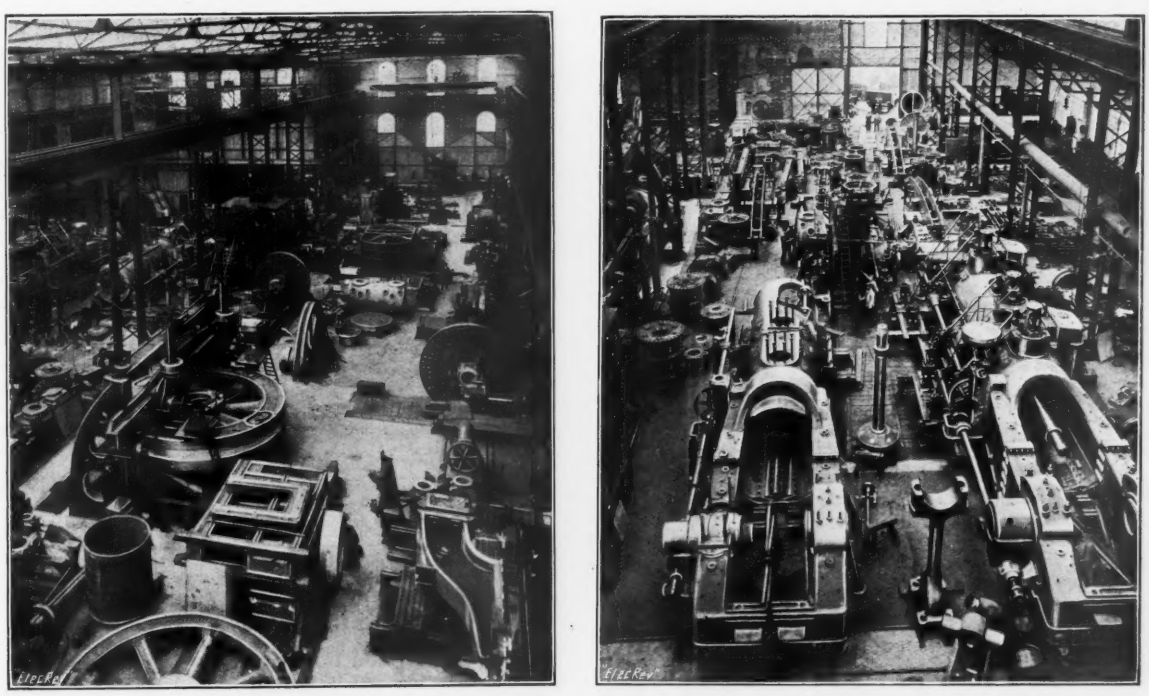
Easy access from all sides, especially to the lower part of the commutator and the corresponding brushes, is ensured by the high position of the shaft; a ladder spanning the collector and insulated from the iron frame of the machine also makes the upper part of the collector readily accessible. Current is collected by carbon brushes which, like the brush-holders, are, even during operation, readily exchangeable separately and independently of one another.

The generators are designed with shunt windings for self-excitation, and have reversing poles excited by the main current. Commutation is, of course, effected without sparking at all pressures and loads, without any shifting of the brushes.

ENGLISH GAS-ENGINE PLANT FOR JAPAN.

SOME time ago the Lilleshall Co., of Oakengates, builders of the well-known Nuremberg gas engine in this country, secured an important contract to supply the Japanese Government with four 1,500-KW. engines of this type, which are coupled to Dick, Kerr alternators, and supplied with gas from Mond producer plant made by the Power Gas Corporation.

This plant is installed in a power station at Kamata, and will generate energy at 11,000 volts and 25 cycles for use on the electric railway between Tokio and Yokohama.



LARGE GAS-ENGINES UNDER CONSTRUCTION IN THE SHOPS OF THE LILLESHALL CO.

The gas engines are of the tandem double-acting type, with cylinders 47¼ in. in diameter and 51⅛ in. stroke. The engines will run at 94 R.P.M., and each will develop about 2,130 B.H.P., which is slightly under their normal rating of 2,400 B.H.P. at 100 R.P.M.

The total weight of each engine and fly-wheel is 400 tons, the fly-wheel with magnet poles weighing 100 tons.

Each cylinder weighs about 25 tons and the bed-plate 55 tons, the latter being made in two parts for the sake of transport from the coast to the place of delivery.

The cylinders are of cast-iron and of symmetrical shape, thus lessening the risk of unequal stresses in the castings. Large cooling water spaces are provided, and are arranged so that the coldest water flows past the hottest part of the cylinder. The inlet valves are above and the exhaust valves below the cylinders, the exhaust valve chests and cylinder covers being water-cooled, while the latter can be removed independently for internal inspection of the cylinders or valves.

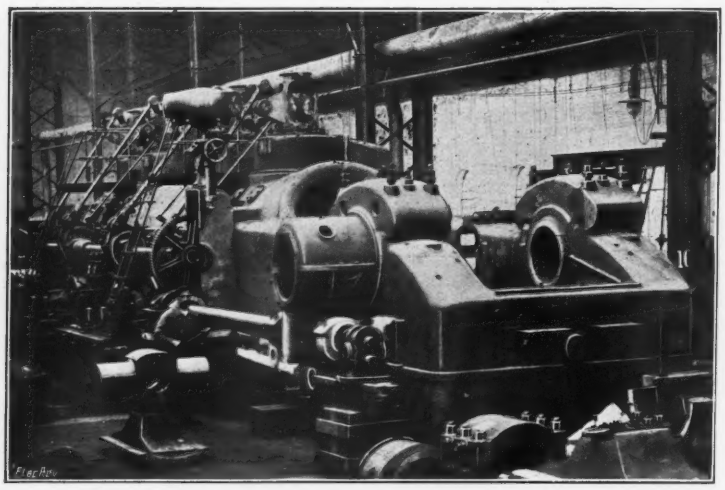
The pistons are water-cooled through hollow crucible steel piston rods, pistons and rods being carried by three cross-

heads which take the wear off the cylinders, &c. The glands are fitted with floating metallic packing and lubricated by means of oil presses.

The valve gear is very simple, one eccentric operating each set of inlet, mixing and exhaust valves at each end of the cylinder, while the inlet valve is controlled by the governor, giving both varying quantity and quality of gas.

Forced lubrication of all outside parts is provided, and low-tension accumulator ignition, while the engines are started with compressed air.

The fly-wheels are specially built with a soft steel ring cast into the rim for electrical reasons, to take the magnetic flux between the poles. Each engine draws its gas from a large receiver coupled to the principal gas main, while it also exhausts through a tubular boiler which provides steam for working the producer plant.



Large Gas Engine in Course of Erection.

At one end of the station certain auxiliaries are provided, these including four electrically-driven pumps for cylinder cooling water, two similar pumps for piston cooling water—the latter being supplied at higher pressure than the former, owing to the acceleration forces in that case—also two motor-driven air compressors supplying air at 300 lb. pressure to an air receiver near each engine, for starting. The engine room is spanned by an electrically-driven 40-ton travelling crane.

The engines operate in conjunction with an ammonia recovery plant, and the sale of the ammonia sulphate will nearly cover the cost of the coal burned.

The engines are undoubtedly much larger than anything yet made in this country, especially when it is considered that the whole power passes through one crank.

Our various views show the engines in course of construction at the Lilleshall Co.'s Works, and give some idea of the massive proportions attained. We are indebted to the above company for enabling us to give this short description of the plant.

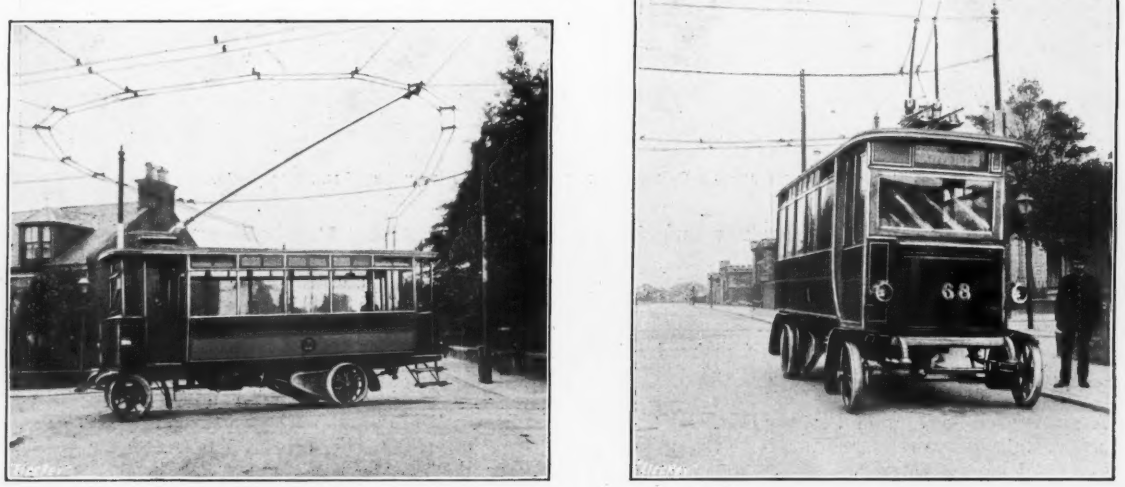
RAILLESS ELECTRIC TRACTION IN DUNDEE.

Dundee was one of the first cities to investigate the possibilities of railless electric traction. The Town Council sent a deputation to the Continent to investigate the working of the system, and for the past three or four years it has been under consideration, finally taking definite form with the opening of Clepington Road route.

Dundee has secured the distinction of being the first city north of the Border to adopt the system, Leeds and Bradford having forestalled it in the South.

Col. von Donop inspected the route on September 3rd; after commenting favourably on the whole equipment, the Colonel remarked that this was the first occasion on which he had been called upon to inspect a railless trolley system. Mr. A. P. Trotter, of the B.O.T., accompanied by Mr. H. Richardson, the city electrical engineer, inspected the overhead equipment, and the route was opened for general traffic on the 5th. The smooth running and comfort of the cars have secured their present and future success. Clepington Road, where the system has been installed, is a very important district in the north of the town, joining up the Fairmuir and Forfar Road tramway sections; the length of route is 2,110 yards, and, with the exception of one or two sudden bends, the road is fairly straight.

The Corporation Electricity Department erected the overhead equipment, which is carried out on the span-wire system, two sets of positive and negative wires running the whole length of the route.



Railless Electric Traction in Dundee: View of Cars and Overhead Construction.

The 00 gauge grooved trolley wires are held in position by mechanical ears, and line hangers of the twin straight gun-metal type are used, while for curves, single and double pull-offs are fitted.

The span wires are held in position by Brooklyn strains attached to straps on the poles. Finials are the only orna-

ments on the latter, bases and collars having been omitted. In some parts of the route, rosettes are attached to suitable buildings to secure the span wires.

The average distance between the poles is 105 ft. Where telephone wires cross the road, guard wires have been erected. At three points on the route section boxes have been placed, each fitted with positive and negative switches, and a lightning arrester on the line wire.

The two cars at present running were supplied by the R.E.T. Construction Co., London, and they are designed to carry 28 passengers. The entrance to the cars is at the back on the near side, and glass screens are fitted to both ends, to protect the driver and conductor during stormy weather.

The chassis were constructed by Messrs. Milne, Voss & Co., Birkenhead, and the electrical equipment, consisting of two 20-H.P. series motors, a special controller made for this class of traction, and the usual circuit-breakers, was all supplied by Messrs. Siemens Bros., Ltd. The motors are connected to a countershaft by worm gearing, and from the countershaft there is a chain drive to the rear wheels.

Two brakes are fitted, one a foot brake which acts on the countershaft, the other a hand brake fitted on the hubs of the back wheels.

The time occupied on the journey is six minutes, at an average speed of 14 miles per hour.

To enable the cars to travel on the ordinary tramway track, one of the trolley arms is held from the overhead wires by a bracket, and a trailer, which is used to connect the return wire to the rail, is lowered from the conductor's platform. The trailer is furnished with a small wheel which fits into the groove of the rail, and two massive copper blocks are provided to ensure proper contact.

Our views show the general appearance of the cars, and curves on the overhead equipment.

THE ENGINEERING EXHIBITION AT OLYMPIA.

There is now running at Olympia a very large engineering and machinery exhibition, which, while it only here and there directly represents electrical manufacturing, is undoubtedly worthy of a visit from all of our readers who can spare the time. It will appeal particularly to technical men who desire to keep themselves posted with regard to the latest progress in machine tools and some other departments of engineering, and we have no doubt it will attract many buyers, both home and foreign, between now and October 26th—the closing date. One of the outstanding features of the Exhibition is the very practical illustration that it affords of the advantages of co-operative effort among exhibitors in securing an effective working demonstration. This result has been secured by the display being organised by the Machine Tool and Engineering Association, with Messrs. C. H. Luke and F. W. Bridges as organising managers. It is claimed by these gentlemen that the collection of machine tools represents "the finest specialised machinery display ever held in this country." Whether that be so or no, it is a fact that a very large portion of the building is occupied by machine tools of all makes and types which are exhibited performing their manifold operations, the machines being representative of the latest stages of development of design. In addition to these, there is a whole host of mechanical engineering, and some electrical and general exhibits, the number of exhibitors all told being about 250.

The prospect from the gallery is certainly more pleasing than we have observed at some other exhibitions in the same building, for in the main area there is a notable absence of built-up offices and high partitions. Although the number of purely electrical exhibits is naturally very small—the electrical trade had its own big effort last year, and few of our firms were ready for another at the same place so soon—electricity plays so essential a part in connection with modern machine-tool engineering, that it is not surprising to find the electric motor rendering unfailing service here, there and everywhere.

In order to give a better idea of the extent to which the machinery is electrically driven, we may mention that the British Thomson-Houston Co., Ltd., of Rugby, alone have supplied to exhibitors no less than 85 of their motors and control panels for driving machine tools, some of which are being operated by silent "Fabroil" pinions, where absence of noise is a consideration. These pinions are self-lubricating and impervious to oil or water, and are stated to be unaffected by rats or other vermin. The following is a list of the firms at whose stands these motors can be seen by the visitor :—

Alldays & Onions; Archdale & Co.; Bailey & Co.; Colchester Lathe Co.; Consolidated Pneumatic Tool Co.; Darling & Sellers, Ltd.; Hoffmann Manufacturing Co.; Smith & Coventry; H. W. Ward & Co.; Holbrook & Sons; S. N. Brayshaw; H. Rossell & Co.; Humpage, Thompson & Hardy; Burton, Griffiths & Co.; The Judson-Jackson Co.; Harper, Sons, & Bean; Coventry Chain Co.; Denham Engineering Co.; Frederick Pollard & Co., Ltd.; Cambridge Scientific Instrument Co.; Wadkin & Co.; J. W. Barnes; A. Herbert, Ltd.; Parkinson & Sons; Schuchardt & Schutte; Dickinson Machine Tool Co.; Redman & Son; Timbrell & Wright; Jones, Pollard & Shipman, Ltd.; Charles Churchill & Co.; Osborne and Co.; G. Richards & Co.; G. H. Alexander; Theodore Butler, Ltd.; E. G. Wrigley & Co.; Armfield & Co.; Mayer & Schmidt; The Carborundum Co., Ltd.; Broom & Wade, Ltd.; The Tormo Manufacturing Co.; The United Machine Tool Works.

There are several excellent exhibits of electrical instruments, to which we shall refer later, and here and there one comes across a stand with electric light fittings or lifting magnets and electromagnetic chucks, forced-draught and superheater plant, steam fittings, CO_2 recorders, friction clutches, small electric generators, water softeners, turbine plant, power hammers, castings, an electro-galvanising process, engine and other oils, pumping machinery, oxy-acetylene welding apparatus, and a great variety of engineering supplies and stores.

At the opening ceremony, which was performed on the afternoon of October 3rd, Earl Selborne, in his speech, made reference to the great importance of the prospective foreign markets to the British engineering manufacturer and to the necessity for nursing them; the competition of foreign firms, and the need to meet that competition by co-operation and efficient organisation on the part of British firms in order to ensure the world knowing the truth about our abilities. Earl Selborne was followed by Mr. J. M. Robertson, M.P., of the Board of Trade, who also dwelt upon the importance of rival firms in a particular trade co-operating in order to secure proper representation at international exhibitions.

Bonecourt Surface Combustion, Ltd., (Parliament Mansions, Victoria Street, London, S.W.).—One of the most interesting exhibits is that of the system of heating with gas developed by Prof. Bone and Mr. McCourt, which has already been described in our pages. Some examples of furnaces and stoves fired on this system are shown, and in the yard is a gas-fired boiler supplying steam to several of the exhibitors. The boiler is designed to evaporate 550 lb. of water per hour at 120 lb. pressure, and is supplied with gas and air by Sturtevant fans at a pressure of about 18 in. of water. The water level is controlled by a Crosby automatic feed regulator. The tubes of this boiler are about 3 in. in diameter, and are filled with small lumps of refractory material, which baffle the gases and ensure that they shall impart their heat to the boiler, the gross efficiency of which is stated to be no less than 95 per cent., and the net efficiency, after allowing for the driving of the fans, 92 per cent., without an economiser. Most of the transfer of heat takes place in the zone of active combustion at the front end of the tubes, and the result is an energetic longitudinal circulation of the water in the boiler; but the tubes show no undue wear at any part of their length. Tests made by an independent boiler expert on a boiler at the Skinningrove Iron Works, capable of evaporating about 4,000 lb. per hour, and fired with coke-oven gas, in July last, showed a net efficiency of over 90 per cent., although the boiler was not lagged. The condition of the combustion inside the boiler is indicated by a short section of tube containing refractory material, through which a small amount of the gas and air mixture is allowed to pass, the appearance of the white-hot lumps enabling the attendant to judge when the proper mixture is attained. This is the first occasion on which the system has been publicly exhibited.

Messrs. Hindle, Maitland & Co. (100, Deansgate, Manchester).—This firm show their patent electric press, suitable for pressures up to 30 tons and designed for baling goods, which has been fully described in our pages; we understand that a considerable number of these presses have been installed by some of the largest textile houses, superseding hydraulic presses, as they show a very large economy of energy. The press exhibited will bale 100 times, up to its full capacity, with one Board of Trade unit. Other exhibits are the Ensign electric fire, and Tinol paste solder. Messrs. Neville, Williams & Co. are the London agents for the press.

Eyre Smelting Co., Ltd. (Barden Road Works, Tonbridge).—At this stand are shown "Bamber's" non-encrusting zincs for primary cells, in a variety of shapes; an enormous number of these have been supplied to the Post Office, as well as other authorities. Their new "Household" zinc rods are exhibited. Anti-friction metals form the bulk of the exhibit.

The Hoffmann Manufacturing Co., Ltd., Chelmsford.—An exhibit of moving machinery running entirely on "Hoffmann" ball bearings is shown, as well as specimens of the various types of ball and roller bearings manufactured by the firm.

The machinery is driven by a 10-h.p. British Thomson-Houston d.c. motor, ventilated type, shunt wound. This is fitted with "Hoffmann" ball bearings; grease is used for lubricant, and therefore no trouble is experienced from excess of oil getting on the windings and commutator. Also it is impossible for the bearings

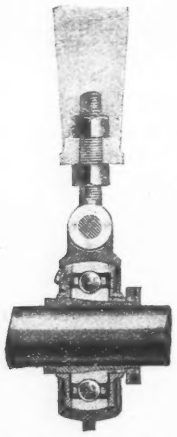


Fig. 1.—Hoffmann Hanger (Section).

to seize or to wear and drop the armature on the pole-pieces. When a motor is once charged with grease, it will run for many months, or even years, without attention.

The motor drives a line of 2½-in. shafting running on "Hoffmann" ball-bearing hangers, of which we reproduce a section (fig. 1). Driven from this shaft is a 10-in. "Churchill" internal grinding machine, mounted on "Hoffmann" ball bearings and running at the extremely high speed of 30,000 r.p.m. There is no difficulty in running it continuously at this speed, and as the wear in ball bearings is practically nil, the machine keeps its accuracy unimpaired, and the micrometer adjustment to the slide on which the grinding spindle is mounted gives accurate readings to ·00025 in. diameter of work.

Driven from the same shafting through a countershaft (also running on "Hoffmann" ball bearings) is a "Churchill" vertical surface-grinding machine mounted throughout on "Hoffmann" ball bearings. As this machine is some 12 ft. overall in length, it

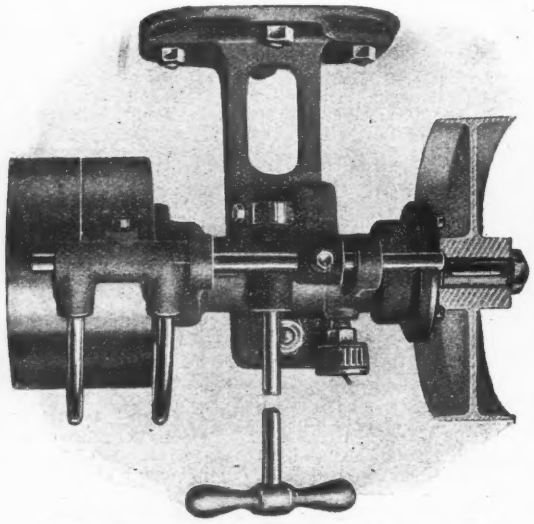


Fig. 2.—Hoffmann Ball-Bearing Countershaft.

is capable of dealing with the heaviest work, and also, if desired, work of comparatively small size. A magnetic chuck 36 in. × 10 in. is used with this machine.

Various models are shown to illustrate the free running of ball bearings, as well as the countershaft which is illustrated herewith. This is very easy to erect, as there is only one bracket to fix. The main spindle is mounted on two rows of ball bearings, and the loose pulley on another. The belt-shifting gear is automatically locked in both positions.

W. Silversteen & Co., 147, Cannon Street, E.C.—This exhibit comprises various types of electromagnets. A magnet of rectangular shape, 3 ft. long × 8 in. wide × 8 in. high, is shown, capable of lifting iron blocks up to 36 cwt. for loading and transporting pig-iron, bars, tubes, &c. The power consumed in exciting the magnet is small in comparison with the load, owing to the advantageous arrangement and good utilisation of the active material, a low tare resulting therefrom as well. The power consumption is 400 watts, and the tare 4¾ cwt. The starting is effected by a controller, fitted with a magnetic blow-out. The wiring is arranged in such a way that the magnet is first excited with part of the standard voltage only; then the lifting commences, and the whole voltage is put on. When stopping, the magnets are depolarised to ensure a quick and safe release of the load. This is of importance when scrap and turnings are being handled, as otherwise they remain in position owing to the remanent magnetism. To take up the slack in the

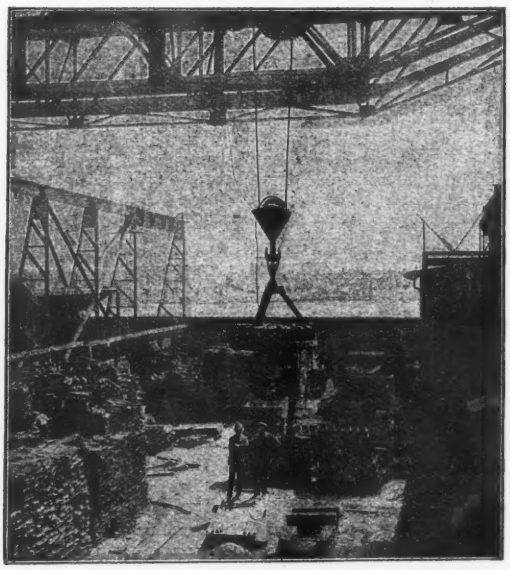


Fig. 3.—Silversteen Lifting Electromagnet in Use.

electric cables when the load is being lifted, a cable drum is provided, with automatic winding-up gear.

For separating iron parts from any raw material, such as palm kernels, cotton, flour, cocoa beans, &c., or from foundry sand, brass turnings and waste of any kind, electromagnetic separators are now being supplied instead of the permanent magnets hitherto in use. A machine is exhibited which is capable of treating about

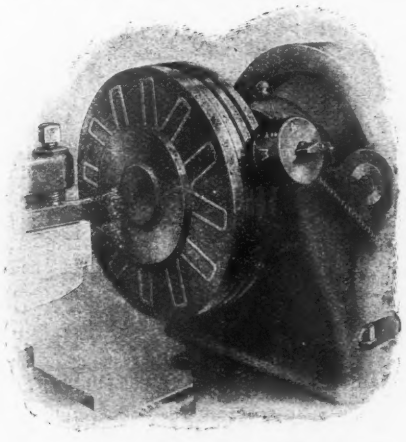


Fig. 4.—Electromagnetic Chuck.

5 to 6 cwt. of turnings per hour. The driving power required is ⅛ h.p., and 110 watts is used for exciting the magnets. The magnetic drum is 3 in. in diameter × 9½ in. long, running at 350 r.p.m., whilst the driving shaft runs at 120 revolutions. A feeding hopper and long shaker are provided for the filling and distribution of the material to be treated. A starter is fixed to the machine. These machines are in use in various factories.

A number of rectangular chucks for milling, planing, shaping, surface grinding machines, &c., are shown, also circular ones for ordinary and horizontal lathes, grinders, &c. They represent a great saving in labour in setting up work on machine tools, and should be of great use for repetition work. The circular chucks are made in sizes from 4 to 59 in. in diameter (fig 4), and the rectangular ones from 10 in. × 5½ in. up to 63 in. × 16 in. Owing to the

stronger magnetic action required, all sizes are made of wrought, instead of cast iron. A depolariser for removing all traces of magnetism from iron or steel, a hand magnet of 3½ in. diameter to lift 66 lb. with about 20 watts, and an eye magnet for hospitals and factories are also on show.

The following are some of the gallery exhibits :—

Messrs. Mosses & Mitchell, of 122-124, Golden Lane, London, E.C., show a representative collection of their vulcanised fibre goods for electrical and many other purposes, "Moorit" steam jointing, ebonite sheets, rods, &c., the "M. & M." bonded asbestos brake lining, Blake's insulated staples, and—what will probably interest many of our readers personally—a line of fibre golf clubs.

The Vacuum Oil Co., Ltd., of Caxton House, London, S.W., exhibit their various lubricating oils for steam, gas and Diesel engines, turbines, transformers and switches; also a number of lubricators, including a forced feed automatic one for cylinder lubrication.

Prices' Co., Ltd., of Belmont Works, Battersea, S.W., also show lubricants for steam engines and turbines, oil engines and electrical machinery, as well as insulating oils for transformers, oil-break switches, &c. Other exhibits illustrate the various stages in oil production and refining, and apparatus for oil-testing.

Messrs. Edgar Vaughan & Co., Ltd., Corporation Street, Birmingham, also have close at hand a display of oils for steam, gas engine and motor service.

The "Comptometer" adding and calculating machine will be found at the stand of the Felt & Tarrant Manufacturing Co. (Bank Buildings, W.C.); several types of silent chains, roller and block chains, and chain sprockets are exhibited by Messrs. Brampton Bros., Ltd., of Oliver Street Works, Birmingham; Messrs. Valite, Ltd., demonstrate their oxy-acetylene welding and cutting plants, and show acetylene lamps and lighting plants; the Efandem Co., Ltd., 83, Upper Thames Street, E.C., include among their exhibited lines the "T.E.C." patent spring terminals; jointings, packings and rubber sheetings and other cognate lines are exhibited by Messrs. James Walker & Co., of Garford Street, West India Dock Road, E.; Mr. H. C. Slingsby, of Old Street, E.C., is once again present with his patent trucks and ladders, and the L.E.B. Engineering Co., Ltd., of 68, Pentonville Road, London, N., have on view a model of a new system of fixing tubes in a steam surface condenser, and a new system of piston rings especially adapted to internal combustion engines, and so on.

There is a large instructive and interesting collection of engineering work done by the students at the Polytechnic and Technical Institutes controlled by the L.C.C. Education Department, and the Board of Trade (Exhibitions Branch), has with commendable enterprise put on view a model (one-hundredth full size) of the British Pavilion at the Ghent International Exhibition of 1913. It is to be hoped that a study of this model and of the large and useful plans on the wall, together with the courteous and convincing arguments of the gentlemen in charge thereof, will so impress the minds of exhibitors and other visitors at the present Exhibition, that the British machinery display at Ghent will be a complete success.

The Linolite Co., Ltd., 25, Victoria Street, S.W., effectively show their 'Tubolite" system of electric lighting, with aluminium reflectors, for picture, show-case and other service, and on the same stand they also exhibit the Woodhouse patent system of steel casing for electrical conductors, with which our readers are already familiar.

Messrs. John Dugdell & Co., of Failsworth, have a good collection of their movable electric lighting fittings and accessories for all classes of service, and adjustable for almost every conceivable position. New adaptations of these fittings are continually being introduced by the firm, and we were interested in several of these applied to brackets, pendants, standards and special work. We may mention the following:—The No. 235, 7-ft. extensible floor standard for car-sheds, erecting shops, &c.—this fitting is supplied also in polished brass, bronze, nickel, &c., for domestic service; and No. 313, a dining-room pendant fitting which can be either raised or lowered or extended lengthwise whichever way the dining table has to be lengthened. We understand that the firm have experienced a great success with their speciality, and the gratifying reception accorded to them in the foreign markets has encouraged Messrs. Dugdell to place their fittings on exhibition at the Boston electric show now in progress.

(To be continued.)

NOTES.

(*Continued from page 578.*)

The Electro-Harmonic Society.—This Society opens its twenty-seventh season on Friday next, October 18th, with a smoking concert in the King's Hall, Holborn Restaurant. The dates of other concerts are as under :—

Monday, November 18th, ladies' night.
Friday, December 13th, smoking concert.
Friday, January 10th, 1913, smoking concert.
Tuesday, February 25th, ladies' night.
Friday, April 4th, smoking concert.

Rectifier for Tramway Work.—The Canadian *Electrical News* recently mentioned that Dr. Cooper Hewitt had developed a mercury vapour rectifier capable of supplying energy to tramway cars. With this new apparatus an output of 700 amperes has been obtained as compared with 50 with the old type.

Red Tape, or High Finance?—An extraordinary procedure has been adopted by the Corporation of Liverpool, in connection with what is called "the Current Official List of Corporation Contractors." A circular has been issued to the contracting firms which are at present on the list, informing them that the list will expire at the end of this month, and that "the name of any firm on the present list can only be inserted in the list for the ensuing 12 months upon payment of a registration fee of 5s." before October 31st.

We have, unfortunately, had occasion to place on record many instances of contemptible meanness on the part of local authorities towards their own employés—their electrical engineers in particular—but now, it seems the scope of their operations is to be extended; extortions are to be levied upon those who, though beyond the control of the Corporation, can yet be taxed on the plea of registration.

The fee in itself is of small amount at present, but these items always tend to increase, and who can say what value the Corporation of Liverpool will eventually attach to the privilege of admission to the official list, and of taxation? And what will this tax upon industry amount to when we multiply the average fee by the number of manufacturers and also by the number of municipal authorities? The principle is, in our opinion, wholly wrong, and we are surprised to find that it was adopted by a resolution of the Council. The practice savours rather of the methods of a pettifogging solicitor, or of a Chancellor of the Exchequer, than of the authority controlling one of our most progressive and enlightened centres of industry, and we trust that this unworthy and undignified resolution will soon be expunged from its honourable records.

Imports and Exports in September.—The trade returns issued this week show that there was a continuance of the increased activity in our foreign trade during last month, whereas in September last year certain labour struggles were still in progress. Of course it has to be remembered that the figures include manufactures which were "held up" during the labour trouble at the docks, also that in many cases prices had been raised. Another fact to be borne in mind, however, is that this year September had one working day less than the corresponding month of 1911. The electrical and machinery figures, so far as available, are most satisfactory, being as follows :—

Imports.	*Sept.*, 1912.	*Inc. or dec.*
Electrical goods and apparatus, other than machinery and telegraph and telephone wire...	£114,569	Dec. £10,859
Machinery	£489,012	Inc. £62,033

For the nine months down to date, the total of electrical goods and apparatus is £1,036,376, showing an increase of £23,733, and that of machinery £4,995,829, showing an increase of £584,181.

Exports.	*Sept.*, 1912.	*Inc. or dec.*
(*a*) Electrical goods and apparatus (as above)	£486,356	Inc. £277,024
(*b*) Machinery	£2,874,666	Inc. £756,186

For the nine months the totals for these two classes of exports show that the advances have been (*a*) £1,207,918, and (*b*) £1,520,440 respectively. The total for (*a*) has been £3,198,770.

Fatalities.—An inquest was held at Guisborough on Friday last upon the body of a 16-year old lad named Tom Welburn, who was killed in the Spawood Mine the previous day. John Morley, a youth, stated that shortly after deceased had passed him going to his work the electric lights went out, and he heard a cry. Very soon afterwards he found Welburn lying with the broken end of an electric wire in his hand. Witness ran and switched off the current. Artificial respiration was tried without effect. Mr. Dent Oliver, chief electrician at the mine, said he went to the scene of the fatality two hours later and found one of the wires broken and the insulation of the other damaged. In his opinion deceased had taken hold of the wires and forcibly pressed them together, thus damaging the insulation. When that was done the live wires would come into contact and a short-circuit be established. The neutral wire was broken and the live wire insulation damaged. The wires were over 6 ft. above the roadway, and did not sag downwards. The wires were all properly insulated, and the boys had no right to touch them, though sometimes they played with the switches. The pressure was 250 volts. There had been no fall of roof which might damage the wires. In recording a verdict of "Accidental Death," the Coroner observed that it was the first fatal accident due to electricity which had occurred in the Cleveland mining centre.

On October 3rd the Liverpool Coroner held an inquest into the death of Paul Lyon, 39, labourer, who was killed in the controller house at Messrs. Bibby's extension in King Edward Street three days before. The man who was working for the building contractors was engaged in the concreting of the electric motor house. There was only about a foot of room between him and the electric lift, and it appears that the current which operated the lift was switched on, and deceased came in contact with the apparatus and received a shock at 220 volts, with fatal results. Mr. Thos. Davies, an expert witness, said the building was based on steel girders, and the conditions could scarcely have provided better conductors. The jury returned a verdict of "Accidental Death."

A correspondent states that a distressing fatality occurred on Monday morning at Messrs. Jones's Sawmills, Larbert, Stirlingshire. Overnight the storm had broken one of the overhead wires conveying current to the works, and on Monday morning a lad aged 15 years, named Thomas Hannah, was found dead under the wire.

Economy not Fraud.—A curious illustration of the economy resulting from the use of metallic-filament lamps was recently reported in the German Press. At the Criminal Court of Duisburg, an engineer a few weeks ago was accused of having tampered with electric meters, and of thus having, on behalf of his employer, cheated the local electricity works of several hundred marks. The evidence brought by the plaintiffs showed that there was an enormous reduction in the electricity bills rendered for the meter in question.

The accused engineer indignantly denied the charge, and stated that the large difference in the consumption was due to the installation of Osram lamps; in one year the amount of bills for energy was M. 587, while in the following year, after these lamps had been installed, the amount was reduced to M. 188. It was conclusively shown that Osram lamps effected a saving of at least 70 per cent., and the jury returned a verdict in favour of the defendant, with costs

Travelling Expenses to India.—In the City of London Court on Tuesday, Mr. E. C. Ives, of West Ealing, sued the Calcutta Electric Supply Corporation, Ltd., Salisbury House, London Wall, for £17 2s. 3d., the difference between first-class and second-class passage from India to London.—Mr. R. W. Turner appeared for the plaintiff and Mr. Roland Smith for the defendants.—It seemed that the plaintiff, a cable jointer, was engaged by the defendants to go to Calcutta in 1907 for five years at a salary of £200 a year, with increments, and he went. On his return he claimed to be entitled to first-class passage home; and as the defendants would only give him second-class passage, he now claimed the difference. His agreement provided that if he was ill and the engagement terminated during the five years he should have a second-class berth; but if he stayed for the full period he was then to have first-class accommodation.—Defendants said that was a clerical error on the part of their London office, and that the plaintiff had been paid £34 in full discharge (including second-class berth), which plaintiff had accepted.—Mr. Turner said that the cheque was accepted only on account, after warning the defendants.—Mr. Francis R. Reeves, defendants' secretary, said he had engaged many mechanics to go to India, but he had never heard of one of them going first class. A man like the plaintiff would be in a very uncomfortable position in the saloon of a first-class mail steamer. He recently sent a man out at £600 a year, who went second class. They were not defending the action because of the amount in dispute.—Judge Lumley Smith, K.C., thought that when commercial people like the defendants made mistakes they were generally held to them. The mistake was not mutual.—Judgment for the plaintiff with costs.

Clyde Diesel Engine Builders.—According to the *Standard*, the Burmeister & Wain Co. have acquired from Messrs. Harland & Wolfe the engine shops recently taken over with a shipyard which the latter purchased, and will build Diesel engines; the Beadmore engine is at present built at Dalmuir, Carel engines at Port-Glasgow, and F.I.A.T. engines at Greenock. It is also roported that an Admiralty order has been placed for a M.A.N. engined ship with another Clyde firm. It thus appears that five types of Diesel engines will shortly be built by local firms.

The Gas Campaign.—On Tuesday this week the British Commercial Gas Association met at Manchester, some 500 members being present at a reception by the Lord Mayor in the Town Hall. Early in the proceedings a touch of humour was introduced by Alderman Phillips, of Salford Gas Committee, who said they were not there merely as traders seeking a profit, but they had a nobler purpose; they were missionaries who were going to do their utmost to purify the atmosphere, and make the lives and homes of the people brighter than they were at present. They wanted to increase sunshine. Papers and discussions occupied the day, and late in the afternoon Prof. Vivian Lewes delivered his customary eulogium of gas as the exact opposite of what it is universally believed to be. The interest of the meeting to electrical engineers, however, lies mainly in the evidence it affords of the ability of the gas suppliers to get together, and to carry out a great co-operative effort, in the hope of stemming the flowing tide of electricity supply. The three great labours which the Association had undertaken, said the president, were publicity, sales organisation, and service development. The Association is carrying out its programme with admirable energy and efficiency, and we strongly recommend the suppliers of electricity to give close attention to its proceedings, which will have a material effect upon their own business unless they go and do likewise.

Re Newcastle Exhibition.—Referring to Mr. Potter's letter in our last issue regretting that the machines in the Laundry Section of the recent Exhibition at Newcastle were not heated by electricity as well as driven by electric motors, we are informed that Mr. Buckell took the matter up with Messrs. Eastman & Warne, who promised to do whatever was possible, they having an extensive experience in the equipment of electric laundries. Unfortunately, at present, most of the complete equipments are installed in public institutions, and on shipboard, where the voltage is 100 or thereabouts, and no machines for 240 volts were available. Since these machines have to be adjusted to run at certain definite temperatures, and the watts consumption is proportional to the square of the voltage, it is evident that the high-voltage loadings would have been very poor stock, and for this reason the proposition was found impracticable.

Mr. L. E. Buckell, of the Newcastle-upon-Tyne Electric Supply Co., Ltd., writes, with regard to the concluding paragraph of the account of the exhibits in our issue of September 27th, stating that "it is quite incorrect to say that there were innumerable stands of interest to those concerned in the use of electricity in the works, and in its application to the industrial question. As a matter of fact, there were not more than three or four of such stands altogether in the whole exhibition, and the success of the exhibition, from the point of view of both the attendance of the public and the volume of business done by the exhibitors, may be traced entirely to the fact that exhibits of this nature were not encouraged, and that practically the whole of the exhibits were such as would be of considerable interest to the domestic user."

Educational Notes.—Mr. Stanley Parker Smith, D.Sc., Assoc.M.Inst.C.E., A.M.I.E.E., chief designer for the General Electric Co., Witton, has been appointed lecturer and instructor in dynamo design in the City and Guilds (Engineering) College, South Kensington, as successor to the late Mr. W. E. Robson. Dr. Smith took up his new duties on October 1st. These include ordinary third-year work in dynamo and motor design and electric traction, and post-graduate work on the design, construction, and manufacture of dynamo-electric machinery, in which a special full-time advanced course (30 hours per week for a whole session) was established last year. As preparation for a teaching career, Dr. Smith has had six years' academic training, and seven years in works. For some years he was at the Armstrong College, Newcastle, under Dr. Thornton, and for two years with the late Prof. E. Arnold, of Carlsruhe, as 1851 Exhibition Scholar. Subsequently, he entered the design office of Messrs. Siemens Bros. Dynamo Works, Stafford, and for some years has been chief designer to the General Electric Co., Witton. Quite recently he was awarded a Telford Premium by the Institution of Civil Engineers for a paper on "Single Phase Commutator Motors for Electric Traction on Long-Distance Railways." We wish him every success in his new vocation.

At the Willesden Polytechnic on Wednesday last week, Mr. F. H. Taylor delivered a lecture on "Electrical Engineering" dealing especially with the training of an electrical engineer.

At the County Technical School, Peterborough, a course in electrical engineering is provided, under Mr. R. Rowland, mains superintendent at the electricity works.

Mr. H. Hirst will take the chair at the inaugural lecture on "The Management of Public Electric Supply Undertakings," by Mr. A. Hugh Seabrook, at the East London College on Monday next.

For Sale.—The Blackburn Corporation Electricity Department has for disposal three Lancashire boilers and one set of Green economisers. See our advertisement pages to-day.

Appointments Vacant.—Third-class clerk for the Fulham B.C. Electricity Department (£80); cable jointer, for the Port Elizabeth Municipality (13s. per day). See our advertisement pages in this issue.

The Anchor Hospital and Distress Fund.—The second annual general meeting of members of this fund, in operation at the Anchor Cable Works, was held on October 1st, Mr. J. Bowyer presiding. The objects of the Fund are: (*a*) The granting of annual sums to hospitals and convalescent homes, &c., thereby ensuring to members hospital treatment in case of accident or other sickness, and (*b*) the granting of temporary relief to members in exceptional distressed circumstances, so that shop collections may be discontinued. The hon. secretary, Mr. A. Crooke, reported that every one of the employés at Leigh, including the staff, were members, each member paying 1d. per week. He pointed out the useful work which had been done by the Fund. Members have been sent to convalescent homes and to sanatoria, in addition to recommendations having been issued to members requiring attention at various institutions. Thanks to the generosity of the directors of the company, the committee were enabled to provide, during the coal strike, free dinners to needy members. The families which were in reduced circumstances were also assisted, and the sum of £12 was contributed to the Mayor of Leigh's fund for feeding necessitous children. There was a balance in hand of £72, out of which it was resolved to make the same grants as last year to hospitals and infirmaries, amounting to £47. The following officers were reappointed: President, Mr. James O. Callender; Trustees, Mr. J. Bowyer and Mr. C. Hulme; Hon. Secretary and Treasurer Mr. A. Crooke.

Inquiry.—Makers of the Richardson fuse bridge are asked for.

L. & S.W. Railway Electrification.—In the *Pall Mall Gazette* of Wednesday there appeared an authoritative statement to the effect that the general scheme of electrification has been settled, and the company hopes to have electric trains from the Thames Valley running into Waterloo Station in 18 months.

Holborn Lighting.—On Wednesday night the new system of street lighting in the Borough of Holborn was put in operation. In High Holborn, clusters of three large Osram lamps in lanterns, supported by tall columns, have been employed, with excellent effect. We shall return to the subject in a later issue.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. Grainger, who for many years acted as assistant electrical engineer to the Paisley Town Council, received an appointment under the Limerick Corporation some three months ago, and left for that town. The office vacated by him was advertised, 175 applications were received, and the Council had got as far as a short leet, when it was learned that Mr. Grainger would be quite well pleased to return to his old job after his three months' experience of life in Ireland. The Committee gladly accepted the offer, and agreed to abandon all the applications lodged.

Mr. Herbert Foster, who, after eight years' service as engineer in the electricity department of the York Corporation, has become North-Eastern district representative for the Electrical Co., Ltd., of London, has been presented with a handsome 14 days' clock, as a mark of the esteem of his colleagues in the York electricity department.

Mr. Stanley J. Bruford has left the Newcastle Electric Supply Co., Ltd., and is to sail to-day to take up a position with the Madras Electric Supply Corporation, Ltd., as assistant station engineer, in Madras.

The marriage took place at All Saints' Church, Evesham, last week, of Mr. Herbert Horton Smith, of the Worcester Corporation electricity works, and Miss Margaret Newton Lunn. From the staff and employés of the electricity department, Mr. Smith received a divan armchair.

The Bridlington T.C. has appointed Mr. F. Ffrench, the present mains superintendent, as chief assistant at the electricity works, at a salary of £130, rising to £160, and Mr. Leslie A. Thain, of Fleetwood, as charge engineer.

Tramway Officials.—On Sunday morning last, according to the *Western Mail*, an interesting function, illustrating the happy relationship existing between the manager and staff of the Cardiff Corporation tramways, took place at the tramway offices, when Mr. Arthur Ellis was presented with a suite of silver candelabra by a large section of the uniformed staff of the department, as a tribute of the affection and esteem in which he is held by the men under his control, and in celebration of the completion of ten years' service under the Corporation. Mr. Howell David presided, and the presentation was made by Mr. Henry Bishop, one of the oldest tramway drivers in the service, he having been engaged continuously in his occupation for nearly 40 years. In acknowledging the gift, Mr. Ellis, speaking with much feeling, expressed pleasure at the unexpectedness of the presentation, and referred with pride to the goodwill existing between all grades of the department.

Mr. W. T. Robinson, assistant engineer to the Hull Tramways Committee, has resigned his position to take up the general managership of the South Shields tramways.

Mr. T. Harrington, of the Torquay Tramway Co.'s electrical staff, who is taking up an appointment in the Maidstone tramway department, has been presented by his colleagues with a silver cigarette case.

General.—Mr. J. W. Buck has resigned his position with Messrs. Siemens Bros. Dynamo Works Co., Ltd., and has joined Messrs. Turner & Burger, electrical manufacturers, of Aubrey House, Ely Place, Holborn, E.C.

Mr. Alfred H. Gibbings, of the firm of Alfred H. Gibbings and Co., 564, Cangallo, Buenos Ayres, will be in England on a short business visit during November and December, and his address while here will be 91, Palmerston House, Bishopsgate, E.C. Messrs. Alfred H. Gibbings & Co. are engineers and contractors and have an important business in South America, and among other representations they are the agents for Messrs. James Howden & Co., Ltd., of Glasgow, for turbines, steam engines, boilers, forced draught, oil fuel apparatus, &c. Mr. Gibbings is open to negotiate with firms desirous of representation in the Argentine.

At a farewell dinner, held on the 2nd inst. at the Reggiori Restaurant, Mr. Dobson, senior assistant electrical engineer, was presented with a handsome marble clock, as a mark of esteem, by the electrical staff of the Metropolitan Railway, on his leaving the company to take up an appointment with the L. & N.W. Railway, in connection with the electrification of their line. Mr. Page (chairman), on making the presentation, spoke of the past experience and work of Mr. Dobson, during his connection with the company, in highly complimentary terms. Mr. Dobson suitably replied. The evening was concluded with various vocal and instrumental contributions by members of the staff.

Mr. J. Frank Jones, foreman electrician in the installation department of the Ebbw Vale U.D.C., has been appointed installation inspector under the municipality of Shanghai.

Mr. Justus Eck, engineer-in-chief to the Union Electric Co., Ltd., and deputy-chairman of the Electrical Trades Benevolent Institution, sails on October 11th by the ss. *Osterley, en route* for Australia. After a tour in the interests of his company—covering, amongst other places, Fremantle, Adelaide, Melbourne, Sydney, Brisbane and Tasmania—Mr. Eck will proceed to New Zealand, returning home *viâ* Canada and New York. His complete journey will occupy some eight months.

Obituary.—Mr. W. E. Robson.—We regret to record the death of Mr. W. E. Robson, lecturer and instructor in dynamo and motor design in the City and Guilds (Engineering) College, South Kensington. Mr. Robson joined the staff of the college in 1906, after he had had some teaching work in evening classes, and a large and varied practical experience with several well-known firms. Amongst these may be mentioned Messrs. Scott & Mountain, Gateshead; Messrs. Armstrong, Whitworth & Co., Elswick; the Brush Electrical Engineering Co., Loughborough, and the British Electric Plant Co., Alloa. He made many improvements in the teaching of design during the six years he was engaged in this work. Last session he conducted an advanced course of instruction on "The Systematic Design, Construction and Manufacture of Dynamo-Electric Machinery," in which the ground covered by college courses was greatly extended. Of these subjects he had made a special study, and in addition to pure design, the many questions involved in the construction of machines, and the organisation of factories for systematic manufacture, were discussed in detail. His untimely decease is a great loss to the college, and to his colleagues, students and friends, with whom he was deservedly popular. As successor to Mr. Robson, Dr. S. P. Smith, chief designer to the General Electric Co, Witton, has been appointed.

It is reported from Canada that, while out in a canoe fishing, Mr. William McCaffrey, assistant manager of the Canadian Electric Co., his wife and three children, were drowned in the Pidgen River, Ontario.

NEW COMPANIES REGISTERED.

Silent Electric Clock Co., Ltd. (124,406).—This company was registered on September 24th, with a capital of £3,400 in 3,000 preference shares of £1 each and 8,000 ordinary shares of 1s. each, to take over the business carried on at 192, Goswell Road, E.C., as the "Silent Electric Clock Co.," and to carry on the business of civil, mechanical and electrical engineers, manufacturers of all kinds of clocks, watches, &c. The subscribers (with one preferred share each) are:—H. W. Porter, 4, Rectory Grove, Leigh, Essex, gentleman; L. W. Morton, 168, St. Paul's Road, Highbury, N., clerk. Private company. The number of directors is not to be less than three or more than five: the first are H. T. W. Bowell, G. B. Bowell and A. G. Gold; qualification, 250 ordinary shares; remuneration as fixed by the company. Registered office, 192, Goswell Road, E.C.

Sevenoaks and District Electricity Co., Ltd.—Prospectus only of proposed company registered on September 25th, with capital £40,000 in £1 shares (30,000 offered at par). Directors: F. Swanzy, J.P., Major Hy. Fulton and H. W. Handcock, all of Sevenoaks. Solicitor: R. Brooks, 24, Lawrence Lane, E.C.

County of Dorset Electric Supply Co., Ltd. (124,372).—Registered September 23rd by S. Morse, 1, Kingsway, W.C. Capital, £75,000 in £1 shares. Objects, to carry on the business of electrical and general engineers, electricians, contractors, manufacturers of electrical apparatus, generators, producers and suppliers of light, heat, sound and power by electricity, galvanism, magnetism and otherwise, suppliers of electricity for all purposes, &c. The signatories are:—W. H. Baxter, The Wilderness, Sherborne, brewer, 250 shares; F. W. Reynolds, Acorn Works, Edward Street, S.E., engineer, 250 shares; Lieut.-Col. C. C. Castleman-Smith, Brenty, Blandford, 250 shares; J. A. Hosker, J.P., Kirkleatham, Bournemouth, 250 shares; J. A. Purvis, 6, Pennsylvania Park, Exeter, engineer, 1,000 shares; H. B. Renwick, Moorgate Court, Moorgate Place, E.C., company director, 1 share; T. W. Cole, Moorgate Court, Moorgate Place, E.C., secretary, 1 share. Minimum cash subscription, 1,500 shares. The first directors, to be not less than three or more than seven, are W. H. Baxter, F. W. Reynolds, Lieut.-Col. C. C. Castleman-Smith, J. A. Hosker, J.P., and A. J. Woodroffe, J.P., Ware, Lyme Regis; qualification, £250; remuneration, £50 each per annum (£25 extra for the chairman). Registered office, Moorgate Court, Moorgate Street, E.C.

International Marine Signal and Carbide Co., Ltd. (124,378).—This company was registered on September 23rd, with a capital of £1,000 in £1 shares, to manufacture and sell marine signal appliances and carbide and such accessories as are required in lighting, telephoning and transmitting signals with or without wire or other lines over, under or through land, water or air. The subscribers are:—Hon. C. Sifton, Ottawa, Canada, chairman of Conservation, 900 shares; W. B. Sifton, 29, Charing Cross, S.W., director of companies, 50 shares; A. P. Collier, 29, Charing Cross, S.W., engineer, 50 shares. Private company. The number of directors is not to be less than two or more than five; the first are Hon. C. Sifton, W. B. Sifton and A. P. Collier; qualification, 50 shares. Registered office, 29, Charing Cross, S.W.

Auto-Electric Transmission, Ltd. (124,446).—This company was registered on September 26th, with a capital of £10,000 in £1 shares, to acquire any inventions relating to other electrically-operated self-propelled vehicles, the electrical or other transmission of power, &c., and to adopt an agreement with H. B. Van Daalen and P. H. Schreiber. The subscribers (with one share each) are:—A. A. Knight, 36, Denbigh Road, West Ealing, engineer; E. W. Roberts, Ashtree Cottage, Dulwich Village, S.E., manager. Private company. The number of directors is not to be less than two or more than five; the first are H. B. Van Daalen, managing director, A. A. Knight O. A. Knight, E. W. Roberts and W. T. Pritchard; qualification, £25. Registered office, 8, Southampton Street, Holborn, W.C.

Glasgow Electrical Engineering Co., Ltd. (8,391).—This company was registered in Edinburgh on September 24th, with a capital of £1,000 in £1 shares, to carry on the business as electrical engineers, &c. The subscribers (with one share each) are:—J. Stevens, 39, Randolph Gardens, Crow Road, Partick, Glasgow, electrical engineer; J. L. Murray, 124, St. Vincent Street, Glasgow, chartered accountant; J. W. Galloway, 157, St. Vincent Street, Glasgow, solicitor. Private company. The numbers of directors is not to be less than two or more than four; the first are J. H. Garby and J. Stevens; qualification, 100 shares. Registered office, 47, Pitt Street, Glasgow.

Electrograph, Ltd. (124,420).—This company was registered on September 25th, with a capital of £3,000 in £1 shares, to carry on the business of advertising agents and contractors by means of the exhibition of electric and other signs, &c. The subscribers (with one share each) are:—J. M. McLaren, 150, Leadenhall Street, E.C., chartered accountant; E. F. Moy, Greenland Place, Camden Town, N.W., engineer; R. H. Gillespie, 29A, Charing Cross Road, W.C., chartered accountant. Private company. The number of directors is not to be less than two or more than five: the subscribers are to appoint the first; qualification, £1. Registered by Smith, Rundell & Dods, 9, John Street, Bedford Row, W.C.

Farad Electrical Co., Ltd. (124,421).—This company was registered on September 25th, with a capital of £1,500 in £1 shares to carry on the business indicated by the title. The subscribers (with one share each) are:—H. J. Whitehead, Farad House, Fairfield Street, Wandsworth, S.W., electrical engineer; H. A. Bysouth, 81, Northcote Road, Wandsworth Common, S.W., electrical engineer. Private company. H. J. Whitehead is the governing director. Registered office, Farad House, 20, Fairfield Street, Wandsworth, S.W.

Johnsons Signs, Ltd. (124,398).—This company was registered on September 24th, with a capital of £3,000 in £1 shares (100 management) to take over the business of advertising agents, designers, producers and manufacturers of banners, showcards, electric and other signs, &c., carried on at 177A, Edgware Road, W., by J. Johnson and W. C. Johnson as "Johnson Brothers." The subscribers (with one share each) are:—J. Johnson, 177A, Edgware Road, W., sign specialist; W. C. Johnson, 177A, Edgware Road, W., sign specialist. Private company. The number of directors is not to be less than two or more than five; the first are J. Johnson and W. C. Johnson. Registered office, 177A, Edgware Road, W.

Invicta Engineering Co., Ltd. (124,426).—This company was registered on September 25th, with a capital of £5,000 in £1 shares, to carry on the business of makers of and dealers in cash registers, adding, weighing, calculating, measuring and other machines (automatic, electrical, pneumatic or otherwise) for the delivery or supply of electricity, air, vapour, liquids or solids (manufactured articles or raw materials), &c. The subscribers (with one share each) are:—V. L. Robinson, High Street Chambers, Coventry, solicitor; A. Howard, 10, Clifford's Inn, E.C., solicitor; E. A. Raves, 21, Salisbury Road, Bexley, mechanical engineer. Private company. The number of directors is not to be less than three or more than five; the subscribers are to appoint the first; qualification, 50 shares. Registered office, 61, The Broadway, Bexley Heath, Kent.

International Bleachers' Corporation, Ltd. (124,578).—This company was registered on October 3rd, with a capital of £5,000 in 4,500 ordinary shares of £1 each and 10,000 founders' shares of 1s. each, to acquire from Electric Bleachers, Ltd., certain inventions for, or connected with, bleaching, and all improvements thereof, and to carry on the business of mechanical and electrical engineers, manufacturers of and dealers in apparatus, &c., used in connection with electric, electrolytic or chemical bleaching, &c. The subscribers (with one share each) are:—W. T. Pollard, 4, Clement's Inn, Strand, W.C., clerk; C. Brant, 5, Kentish Town Road, N.W., clerk. Private company. The number of directors is not to be less than two or more than nine; the subscribers are to appoint the first; qualification, 100 shares; remuneration as fixed by the company. Registered office, 4, Bedford Chambers, Covent Garden, W.C.

Abingdon Electric Supply Co., Ltd. (124,484).—This company was registered on September 28th, with a capital of £10,000 in 900 cumulative preference shares of £5 each, 2,000 preferred ordinary shares of £1, and 3,500 ordinary shares of £1 each, to carry on the business of electric light and power company. The subscribers (with one share each) are:—S. Williams, 38, Parliament Street, Westminster, solicitor: J. H. Edwards, 127, Victoria Street, Bristol, engineer. Private company. The number of directors is not to be more than six: the first are not named; qualification, 50 shares. Registered by Seymour Williams & Co., 38, Parliament Street, S.W.

Works Control, Ltd. (124,607).—This company was registered on October 4th, with a capital of £150 in £1 shares, to carry on the business of manufacturers of and dealers in recording apparatus and instruments necessary for the control of machinery of every description, electric, mechanical, and general engineers, tube makers, wire drawers, lorry proprietors, &c. The subscribers (with 50 shares each) are:—P. de Bruyn, Dusseldorf, Germany, manufacturer; K. Huessener, for the Coke Oven Machinery Co., Ltd., 37, Cole Park Road, Twickenham, civil engineer; C. E. de Bruyn, Castlebury Farm, Wareside, Herts., mechanical engineer. Private company. The number of directors is not to be less than two or more than five: the first are P. de Bruyn, K. Hauessener and C. E. de Bruyn. Registered by Jordan & Sons, Ltd., 116-7, Chancery Lane, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Electric Construction Co., Ltd. (39,292) — Return dated August 1st, 1912 (filed August 2nd). Capital £400,000 in £2 shares (50,000 pref.): 112,100 ord. and 31,390 pref. shares taken up; £2 per share called up on 2,100 ord. and 18,215 pref.; £ 0,690 paid; £246,290 considered as paid on 110,000 ord. and 18,145 pref. Mortgages and charges: £175,000.

Electrical Power Storage, Ltd. (30,313 C)—Return dated August 1st, 1912 (filed August 13th). Capital £100,600 in £5 shares (20,000 ord. and 100 founders'); 66 founders' and 18,592 ord. shares taken up; £5 per share called up on 66 founders' and £4 per share on 3,132 ord., £13,332 paid (including £474 paid on four founders' and 405 ord. shares forfeited; £77,300 considered as paid on 15,460 shares. Mortgages and charges: £20,000.

James Keith & Blackman Co., Ltd.—Issue on September 17th, 1912, of £100 debentures, part of a series of which particulars have already been filed. A memorandum of satisfaction in full on May 22nd, 1912, of debenture dated October 29th, 1901, securing £200, has been filed (notified September 18th, 1912).

T. Clarke & Co., Ltd. — Equitable mortgage on leasehold premises in Chelsea, known as 129, Sloane Street, and 237, Pavilion Road, dated August 23rd, 1912, to secure all moneys due, or to become due, from the company to the London County and Westminster Bank, Ltd., 4, Lothbury, E.C.

Acton Lamp Co., Ltd.—Issue on September 13th, 1912, of £500 debentures, part of a series of which particulars have already been filed.

Merthyr Electric Traction and Lighting Co., Ltd. (57,908).—Return dated March 31st, 1912 (filed July 14th). Capital £100,000 in £5 shares (10,000 pref.); 6,000 pref. and 6,000 ord. shares taken up; £60,000 paid. Mortgages and charges: £48,400.

Sloan Electrical Co., Ltd. (61,528).—Return dated August 7th, 1912 (filed August 16th). Capital £15,000 in £1 shares (5,000 pref.); 5,000 pref. and 2,754 ord. shares taken up; £1 per share called up on 1,254 ord.; £1,254 paid; £6,500 considered as paid on 6,500 shares. Mortgages and charges: Nil.

Electrical Utilities Corporation.—Quarterly dividends of 1¾ per cent. on the preferred stock and ½ per cent. on the common stock has been declared.

Anglo-Argentine Tramways Co., Ltd.—The directors have declared an interim dividend of 4s. per share, being at the rate of 8 per cent. per annum, less income-tax, on the ordinary share capital for the June half-year.

Sao Paulo Tramway, Light and Power Co., Ltd.—The directors have declared a quarterly dividend at the rate of 10 per cent. per annum.

Mexico Tramways Co.—The directors have declared a dividend of 1¾ per cent. for the quarter ended September 30th.

CITY NOTES.

Bahia Tramway, Light and Power Co.

The directors' report for 1911 (as printed in the *Financier*) states that the work of improving and extending the installations at Bahia has been continued, and the property is being brought into better physical condition as rapidly as available funds will permit. The improvements already made are evidenced by the fact that while the gross earnings have increased, the operating expenses for the year show a reduction compared with the figures of the preceding year. Further work has been carried out on track renewals, and about half a mile of additional single track for branch lines has been constructed, the total length of track being now about 18 miles. The rolling stock has also been improved, and the company possesses 34 passenger and freight cars with motors and 24 trailers without motors. Special attention is being devoted to further improvements of the track and rolling stock with the object of securing more economical operation. In the electricity department the erection of the new gas producer plant of 1,500 H.P. has been completed, and the plant is running satisfactorily. In order to provide for future expansion of business and for a sufficient reserve of power, it has been decided to extend the power house and to install an additional generator plant of 1,100 H.P., which will bring up the total effective capacity of the plant to 3,100 H.P. Orders for this plant have been given, and it is expected that with the additional output of electrical energy which will be obtained therefrom no difficulty will be experienced in supplying the much larger demands for electric light and power which will come from new consumers as soon as the final decision has been obtained in connection with the lawsuit instituted by the company's subsidiary, the Cie. d'Eclairage de Bahia, to which reference was made in previous reports. The gasworks has been further improved in the course of the year.

The following are the earnings in Brazilian currency of the three departments for the year 1911, compared with those of the preceding year:—Tramways, net earnings 1911, $364,427; 1910, $261,482; electric light and power, net earnings 1911, $117,820; 1910, $71,338: gasworks, net earnings 1911, $235,986; 1910, $137,927; total net earnings, 1911, $718,233; 1910, $470,749. For the first seven months of 1912 the net earnings at Bahia of all departments show an increase over those for the same period in 1911 of £2,312, or 8 per cent. The fact that the company's subsidiary, the Compagnie d'Eclairage de Bahia, through whom the gasworks and electric lighting and power business is carried on, has not been able to work in full enjoyment of its privileges, has continued to affect adversely the operating results. An important intermediate decision was obtained last year, as mentioned in the last report, but the final decision in the suit has not yet been given by the Federal Judge at Bahia. The delay in obtaining this decision has allowed the violation of the privilege of the Cie. d'Eclairage de Bahia at Bahia to be continued, and seriously affected its earnings, which in turn has handicapped it in the provision of funds for improving its property. Efforts are now being directed to bringing this long-drawn-out lawsuit to a conclusion, and, as the legal advisers expect that it will ultimately result in establishing the Cie. d'Eclairage in its rightful position, that company will then have a claim for heavy damages against the Municipality of Bahia. When the lawsuit above mentioned is concluded a large expansion of business and increased earnings must result, which will enable the question of funding the company's floating debt to be taken in hand.

Dick, Kerr & Co., Ltd.—The report of the directors, which will come before the annual meeting at Cannon Street Hotel, E.C., on Tuesday next, shows that the profits earned during the 12 months' trading to June 30th, 1912, amount to £3,275, which, added to the sum brought forward from last year (£36,892), makes a total of £40,167. Out of this sum the debenture interest and trustees' fees have been paid, and there has been reserved the sum required to provide for the premium payable on the redemption of the present debenture stock. These items absorb £11,851, leaving a balance of £28,316 available for appropriation as under:—Dividend of 6 per cent. per annum on the preference share capital (the half-yearly dividends to December 31st, 1911, and June 30th, 1912, have already been paid), £18,300; carry forward, £10,016. The directors are unable to recommend the payment of a dividend on the ordinary shares for the year under review. They regret that the anticipations expressed in the last report of more prosperous business have not been fulfilled. To some extent this is due to the effects of the railway and coal strikes, which delayed the completion of orders, but principally to unexpected losses on certain contracts which were completed during the year. Mr. John Kerr and Mr. Geo. Richardson, for private reasons, resigned their seats on the board during the year, and the place of the former, as chairman of the company, has been filled by Mr. Cayley, and his place as deputy chairman by Mr. Prestwich.

Suffolk Electricity Supply Co., Ltd.—A financial daily states that the directors declared a dividend on the ordinary shares at the rate of 5 per cent. per annum, the reserves being raised to £3,220.

Mexican Light and Power Co., Ltd.—The directors have declared a dividend of 3½ per cent. on the preference shares for the six months ended October 31st.

Sunderland District Electric Tramways, Ltd.

The directors' report for the 12 months ended October 31st, 1911, which was submitted at the meeting held on October 3rd at Winchester House, E.C., stated that during the period under review the traffic receipts were collected by the Receiver, Mr. Charles Eves, who was appointed by the Court on June 2nd, 1910, on the suit of the prior lien and first mortgage debenture-holders. Since that date, although the board had not been relieved from the control of the undertaking, they had, nevertheless, been deprived of their managerial powers owing to their having no funds at their disposal for the purposes of the company. After providing for interest on the prior lien bonds and the first and second mortgage debentures, and the Receiver's remuneration and expenses, the accounts showed a loss on the year of £688, bringing the aggregate loss to date up to £16,890. During the year the traffic receipts had shown an increase of £1,712, and the working expenses (including the Receivership expenses) had also shown an increase of £1,190. During the year the board was constantly occupied in preparing and considering schemes for the reorganisation of the company, and in carrying on negotiations with various parties for providing working capital, as well as with the Receiver and the principal debenture-holders as to the proposed reorganisation. Ultimately a scheme was agreed upon and submitted by the Receiver to the Court, who directed that meetings of the three classes of debenture-holders should be convened for the purpose of considering, and, if thought fit, of approving such scheme. The meetings were duly held, and the scheme was unanimously accepted. The Court in due course gave its sanction to the adoption of the scheme, which now remains to be carried into effect. The report then proceeds to state briefly the principal features of the scheme.

Mr. H. R. Hogg, who presided at the meeting, said that during the past year the moneys received by the company had still been in the hands of the Receiver, and the board had been hard at work getting through the scheme which was referred to in the report. Several schemes had been previously proposed by which the company should be taken out of the hands of the Receiver and come back to the shareholders, but a scheme had now been agreed upon by the various bodies. There were no fewer than five different bodies interested in the scheme, each of which had the power of stopping any arrangement, and therefore it was a matter of difficult negotiation to get them all into line. However, he was happy to say that that had been done, and the scheme had received the sanction of the Court, and as soon as the Courts again met, he hoped it would only take a week or two before the undertaking again came into the shareholders' hands. The expenses of carrying on a business like that under a Receiver were, unfortunately, heavy, and although the year under review was the best year they had ever had, still there was a deficit of £688, if they reckoned all the payments. Under the scheme, the interest was to be funded in the form of income debentures, and the interest due to the debenture-holders and to the prior lien holders was to be paid off with prior liens. They had arranged for the money for the new prior liens, and as the interest on the first mortgage debentures was being reduced from 5 per cent. to 4 per cent., the standing charges would come down to about £6,300. The chief drawback they had had to contend against, was that the cars were in very bad order, and the Receiver, although he had had their affairs in hand for two years, had not been allowed to spend any money on the renewal of cars. A good deal of money had been spent on renewals of track, but owing to the coal deposits beneath their property, it was a very difficult thing to keep the track in order. Two miles of the track had sunk so much that it was quite dangerous, and required to be renewed altogether, but if they were to spend the money necessary to do this, the fact remained that there was another 7 or 8 ft. of coal to take out, and doubtless the track would again sink. Fortunately it was not a very important portion of their line, as it was only a branch of the main line to Fencehouses Station, and they thought they might be able to arrange motor-omnibuses for the necessary service. They were late issuing their accounts, but this was due to the fact that they could not get the accounts from the Receiver till quite recently. The receipts during the present year, since October 31st last, had been £300 better than in the previous year, which was then the best year they had had, so that by working economically be trusted, in the future, there might be something left over after paying the standing charges. The scheme provided for their borrowing £30,000 on the prior lien bonds, if it was required, and they were issuing £20,000 of them, which would pay off the present prior liens which became due in consequence of the line being put into the Receiver's hands. There was a fair amount of money in the hands of the Receiver, and with the new money brought in they hoped to improve the service very materially. They had already ordered 10 new cars, and he thought they would have to order another 10 as soon as they got the money into their hands to pay for them.

Mr. R. Parker seconded the motion, and the report was adopted without discussion.

Prospectuses.—*Brazilian Traction, Light and Power Co., Ltd.*—The list of applications was to close on Tuesday last of an offer of £1,880,000 5 per cent. 50-year first mortgage bonds of the Sao Paulo Electric Co., Ltd., at 95 per cent.

The Anglo-Argentine Tramways Co., Ltd.—The list is to close on Tuesday next for an issue of £1,500,000 of 5 per cent. debenture stock at 98½. This is part of the total of £6,000,000 authorised, of which £3,000,000 has already been issued. As our readers are aware, this company has absorbed a number of tramway undertakings in Buenos Ayres, and it now owns a unified system of more than 339 miles of track, with 2,436 cars. During 1911 over 299 millions of passengers were carried.

Russian Capital Expansion.

The Russian Allgemeine Electricity Co., has applied to the Government for sanction to increase the share capital for the purpose of extinguishing the loans obtained from the financial group, and increasing the company's working capital in consequence of the requirements imposed by existing orders. It is proposed to issue new shares of £400,000, and to offer them to present shareholders in the proportion of one new to two old shares at the price of 130 per cent. The augmentation will raise the ordinary share capital to £1,200,000, which does not include bonds of £181,000. The existing shares and bonds were introduced on the Berlin Stock Exchange last February at the prices of 135 per cent. and 97 per cent. respectively, and a few days ago the quotations were 178 per cent. and 101 per cent. respectively.

The Russian Tudor Accumulator Co. of St. Petersburg, in which the Berlin Accumulator Works Co. is prominently interested, intends to raise its share capital from £120,000 to £240,000 for the purpose of extending the manufacturing works and being able to deal with the expansion in business. The company, which paid a dividend of 14 per cent. for 1911, proposes to offer the new shares to existing shareholders at par, plus the slight addition required by the Russian law concerning the ratio of share capital to the reserve fund. It was in contemplation to apply for the admission of the shares to quotation on the Berlin Bourse, but it is stated that the directors have now decided to withdraw the proposal to this effect at the forthcoming meeting.

Drake & Gorham, Ltd.—The following report for the year ended June 30th, 1912, will be presented at the annual meeting on October 16th: "After payment of all charges, including bonuses due to staff, there remains a net profit of £9,021, which, with £1,302 brought forward from the previous year, makes a total of £10,323, which it is proposed to appropriate as follows: By payment of a dividend at the rate of 4½ per cent. per annum, £5,625; by writing off from underwriting commission, £3,000; by carrying forward £1,698. The turnover has increased considerably, and the public are realising that superior electric work is the cheapest in the long run. The firm has repeatedly been asked to advise as to the remodelling of plants where efficiency has been sacrificed to first cost. The reduction in cost due to the advent of metal lamps has opened up a new field in the lighting of small houses for which formerly the initial outlay was prohibitive. The additional warehouse for the wholesale business is fully occupied, and this department also shows improved results."

Stock Exchange Notices.—The Committee have appointed special settling days as under:—

Wednesday, October 16th.—Callender's Share and Investment Trust, Ltd.—£115,000 5 per cent. debenture stock.

Thursday, October 17th.—British Columbia Telephone Co., Ltd.—Fully-paid scrip for £400,000 4½ per cent. first mortgage debenture stock.

And ordered the undermentioned securities to be quoted in the Official List:—

Callender's Share and Investment Trust, Ltd.—£115,000 5 per cent. debenture stock.

Rio de Janeiro Tramway, Light and Power Co., Ltd.—Certificates of deposit for 361,492 shares of $100 each, fully-paid.

Sao Paulo Tramway, Light and Power Co., Ltd.—Certificates of deposit for 85,599 shares of $100 each, fully-paid; and certificates of deposit for 5,197 shares of $100 each, fully-paid, marked "*ex* all dividends."

STOCKS AND SHARES.

Tuesday Evening.

There is little to write about this week, so far as stocks and shares are concerned, business in the markets having been restricted materially by the reported outbreak of war in the Near East. This has placed a check upon business all round the Stock Exchange; and in spite of the fact that Capel Court, as usual, clung tenaciously to the idea that the Powers would not be involved, prices were put down impartially lest the unexpected should happen after all.

Home Railway stocks remain dull at the lower levels to which they were reduced on the advent of the formidable situation abroad. Having got down to the extent of a point or two, prices stuck, there being insufficient enterprise to buy the stocks or to sell bears of them. The Undergrounds are quiet, and there has been a further advance in City and South London Ordinary, the price to-night showing a rise of 1 on the week, while the company's two junior Preferences are again a point apiece higher. Nothing has yet materialised as to any agreement with the Midland, but the recent circulators of the idea persist that it will turn out to be correct. Central Londons are somewhat easier. The Company's proposed extension into the Thames Valley is receiving cordial welcome from some of the local authorities concerned; and it is expected that the company's Bill will go through without arousing much opposition. Metropolitans dipped to 59½, which leaves the price 1¼ lower on the week. Districts on balance are ¼ down. Railway officials speak gloomily of the prospects of the Bill which is to be introduced into the session which opened this week, and prophesy as though they had not much faith in the Government's promise to help them in the matter of freight rates. But this seems rather like drowning their chickens before they are hatched, and is a somewhat ungracious attitude to adopt.

Metropolitan Electric Tramway Ordinary shares added $\frac{1}{16}$ to their rise of last week, the recent good report being responsible, of course, for the improvement. The Debenture stock, however, came on offer, and is a trifle lower. London United Tramways Preference shed 5s. of its previous 25s. rise, but the Debenture stock is again a point to the good, it being hoped that the company will be able to place its finances on a thoroughly sound footing by reason of the payment of the Hammersmith Council in respect of the small part of the undertaking recently acquired. The only changes in the British Electric Traction group are falls of 1 in the 4½ per cent. Second Debenture and of ½ in the 5 per cent. Debenture.

No doubt before this appears in print the issue will have been made of £1,500,000 5 per cent. Debenture stock by the Anglo-Argentine Tramways Company at about 98½. Upon advance information of this the present stock fell 1 to 101, and the First Preference shares are ½ down at £5 middle. Sao Paulo Electric Tramway 5 per cent. First Debenture stock is ½ lower upon the offer of £1,880,000 5 per cent. First Mortgage bonds of the Sao Paulo Electric Company, Ltd., at 95. The shares of the Tramway Company are 5 lower at 280; but, seeing that they had a rise of 17 points just before, the reaction does not amount to much. Rio Trams are 2 lower, and Mexico Trams fell a similar amount, the latter company's 6 per cent. bonds easing off to 102½. Dullness in the British Columbia Electric Railway group has lowered the prices of four issues quoted overleaf, the Preferred, Deferred and 5 per cent. Preference being the principal sufferers. Calcutta Trams are unaffected by the declaration of an interim dividend of 5 per cent. Other changes in this department are negligible.

Latin-Canadians as a whole are somewhat irregular. Montreal Light, Heat and Power shares, instead of being quoted with 10 points between the selling and buying prices, have been narrowed to a five-point limit, and nominally the price is 1½ better. Canadian General Electric Common spurted substantially, the price gaining 7; while Shawinigan Water, on the other hand, fell back 2, the Company's bonds and Debenture stock also declining. Mexican Light and Power Common shares continue to droop, in consequence of the unsettled state of the country. Cordoba Light and Power has come into some notice, and the price improved to 96½. Kaministiquia Common enjoyed the distinction of being amongst the very few stocks to improve to-day, Tuesday, the price being 2 up at 145½.

In the English Electricity Supply list the solitary change is a rise of ⅛ in Urban Preference. Save for this, the whole of the stocks and shares quoted are unaltered, the market, however, being extremely firm, with buyers ready to take shares on any decline in prices.

The Telegraph market has had another little bout of excitement in West India and Panama Ordinary. Momentarily the price was run up from 3⅜ to 3¾, reacting afterwards to 3½ middle. Apparently there is still a stale bull account left in the shares, and with the general feeling of caution abroad, it is only necessary for buyers to cease their operations for the price to go back at once. The American division is a little duller. Anglo-American Telegraph Deferred fell ¼; the usual three-monthly dividend of 1½ per cent. on the Preferred stock was declared at the end of last week. Direct United States cable shares fell ⅛. The Eastern section, however, continues firm, and "China" shares hardened to 13½. Western Telegraphs improved to 13⅝, and Reuters still feel the influence of the augmented dividend, the price improving to 11⅝, which is an advance of 5s. on the top of the 7s. 6d. rise last week. It is pointed out, with a certain amount of grimness, that a war in the Balkans would probably benefit Reuters considerably. A little speculative buying of National Telephone Deferred caused the price to put on a point; while amongst other Telephone issues, United River Plate Ordinary rose ⅛ to 7⅛. Marconis rose to 5¼, to react to 4 15/16; the market welcomes the announcement that a Select Committee of the House of Commons is to be appointed to consider the Marconi contract with the Government.

Callenders are steady at 10⅛ upon the declaration of the regular 10 per cent. interim dividend. Henley's Preference rose to 5, their par value, and British Insulated and Helsbys at 7¾ are ⅛ higher, attention having been directed to them by reason of the handsome return which the shares offer at their present price. Dick, Kerrs are flat on the disappointing nature of the report just out. The Ordinary shares have to go dividendless, and, after allowing for Debenture interest, there remains a loss of £8,000 on the year. Babcock & Wilcox lost their small gain of last week, and other Manufacturing stocks and shares are mostly steady. Rubber shares, like many other industrials of the speculative-investment type, were depressed by the foreign political outlook, while the Stock Exchange markets that are affected by the prices of baser metals gave way for a similar reason. The Stock Exchange is rarely pessimistic, but even some of the cheerful souls confess that if peace were to break out—as they put it—this week, time will be required to restore confidence and public bullishness. With money tightening, a 5 per cent. Bank Rate comes within the immediate range of prospect, so that, what with one thing and another, markets are predisposed to go softly in any event just now.

United Electric Tramways Co. of Caracas, Ltd.—The sixth ordinary general meeting of the shareholders of the above company was held on Wednesday at Dashwood House, New Broad Street. A representative of the ELECTRICAL REVIEW, who attended to report the proceedings, was informed that the meeting was private. A reference to the report appeared in our issue of October 4th, page 546.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, October 9th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	per lb.	2¾d.	..
a „ Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29 10	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16 10	..
a Copper Sulphate	„	£26	10s. dec.
a Lead, Nitrate	„	£26 10	..
a „ White Sugar	„	£25 10	..
a „ Peroxide	„	£52	..
e Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (88/90 %)	per ton	£22 10	..
a „ Chlorate	per lb.	3½d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide (98/100 %) (for mining purposes only)	„	7½d.	..
a Shellac	per cwt.	70/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5 5	..
a Soda, Caustic (white 70/72 %)	„	£10 5	..
a „ Chlorate	per lb.	3½d.	..
a „ Crystals	per ton	£9 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£82	..
b „ Wire, in ton lots	„	£102	..
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	9¼d.	..
c „ Tube (brazed)	„	11¾d.	..
c „ „ (solid drawn)	„	10d.	..
c „ Wire, basis	„	9¾d.	..
c Copper Tubes (brazed)	„	1/0¾d.	..
c „ „ (solid drawn)	„	11¾d.	..
g „ Bars (best selected)	per ton	£95	..
g „ Sheet	„	£95	..
g „ Rod	„	£95	..
d „ (Electrolytic) Bars	„	£82 10s.	..
d „ „ Sheets	„	£100 10s.	..
d „ „ Rods	„	£89	..
d „ „ H.C. Wire	per lb.	10½d.	..
f Ebonite Rod	„	5/8	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/7	..
h Gutta-percha, fine	„	..	..
h India-rubber, Para fine	„	4/7	¼d. dec.
l Iron Pig (Cleveland warrants)	per ton	66/8	2½d. dec.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	„	£21 15 to £22	15s. dec.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£8	5s. dec.
e Mica (in original cases) small	per lb.	6d. to 8s.	..
e „ „ „ medium	„	3/6 to 6/-	..
e „ „ „ large	„	7/6 to 11/-	..
p Phosphor Bronze, plain castings	„	11d.	..
p „ „ rolled bars & rods	„	1/0½	..
p „ „ rolled strip & sheet	„	1/1	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	11d.	..
Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£231 to £232	£1 inc.
n „ Wire, Nos. 1 to 16	per lb.	2/7	..
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh's (Vieille Montagne bnd.)	„	£31 12 6	10s. inc.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Brazilian Traction, Light and Power Co., Ltd.—The directors have declared a dividend of 1½ per cent. for the quarter ended October 31st.

Direct United States Cable Co., Ltd.—The board have resolved to pay an interim dividend of 2s. per share, less income-tax, payable on and after 31st inst., making with the interim dividend already paid a total distribution of 4 per cent. for the half-year ended September 30th last.

Calcutta Tramways Co., Ltd.—The directors have declared an interim dividend at the rate of 5 per cent. per annum (2s. 6d. per share) for the June half-year.

Callender's Cable and Construction Co., Ltd.—The directors have announced an interim dividend at the rate of 10 per cent. per annum.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Oct. 8th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bournemouth & Poole, Ord. ..	10	5½	5†	9⅝ — 10⅜	..	5 2 4
Do. 4½ % Pref.	10	4½	4½	8⅝ — 9⅜	..	4 12 4
Do. Second 6 % Pref. ..	10	6	6	10¼ — 10⅝	..	5 11 7
Do. 4½ % Deb. Stock	Stock	4½	4½	98 — 100	..	4 10 0
Brompton & Kensington, Ord...	5	10	9†	8⅝ — 9⅛	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8¼ — 8⅜	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	100	4	4	97 — 100	..	4 0 0
Charing Cross, West End & City	5	5	5†	4⅞ — 5⅛	..	4 13 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	8⅜ — 4½	..	5 6 0
Do. Do. 4 % Deb... ..	100	4	4	94 — 96	..	4 3 4
Chelsea, Ord.	5	5	4†	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	98 — 101	..	4 9 1
City of London, Ord.	10	8	6†	17 — 19	..	4 4 3
Do. 6 % Cum. Pref.	10	6	6	12½ — 14	..	4 5 9
Do. 5 % Deb.	Stock	5	5	118 — 122	..	4 2 0
Do. 4½ % Second Deb. ..	100	4½	4½	99 — 102	..	4 8 3
County of London, Ord... ..	10	6	4†	11⅛ — 12	..	5 0 0
Do. 6 % Pref.	10	6	6	11⅝ — 12⅝	..	4 19 0
Do. 4½ % Deb.	Stock	4½	4½	106 — 108	..	4 3 4
Do. 4½ % Second Deb. ..	Stock	4½	4½	100 — 103	..	4 8 3
Edmundson's, Ord.	5	Nil	Nil	7/16 — 11/16	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	3/8 — 5/8	..	Nil
Do. 4½ % First Mort. Deb. ..	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	4⅝ — 5⅛ xd	..	5 17 1
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛ xd	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	92 — 95	..	4 14 9
Hove	5	9	..	7⅞ — 8	..	5 12 6
Kensington & Knightsbridge, Ord	5	9	8†	7⅛ — 8	..	5 12 6
Do. 4 % Deb.	Stock	4	4	90 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	78 — 82	..	5 9 9
London Electric, Ord.	3	2½	..	1⅝ — 2⅛	..	3 10 8
Do. 6 % Pref.	5	6	6	4⅜ — 5⅛	..	5 14 3
Do. 4 % First Mort. Deb. ..	Stock	4	4	90 — 93	..	4 6 0
Metropolitan	5	4	4†	3⅝ — 4⅛	..	4 17 0
Do. 4½ % Cum. Pref... ..	5	4½	4½	4⅛ — 4⅜	..	4 17 4
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	99 — 102	..	4 8 3
Do. 3½ % Mort. Deb... ..	Stock	3½	3½	86 — 88	..	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	97½ — 99½	..	4 10 6
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅜ — 4⅞	..	5 2 7
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	101 — 104	..	4 16 2
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 11	..	5 9 1
Oxford	5	7½	6†	6 — 6½	..	5 11 6
St. James' and Pall Mall, Ord.	5	10	10†	8½ — 9½	..	5 5 3
Do. 7 % Pref.	5	7	7	6½ — 7½	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 88	..	3 19 7
Smithfield Markets, Ord. ..	5	2	..	1⅜ — 1⅞	..	..
South London, Ord.	4	5	..	3 — 3½	..	5 14 3
Do. 5 % First Mort. Deb. ..	100	5	5	98 — 101	..	4 19 0
South Metropolitan, 7 % Pref...	1	7	7	1⅛ — 1⅜	..	5 12 0
Do. 4½ % First Deb. Stock ..	100	4½	4½	96 — 99 xd	..	4 11 0
Urban, Ord...	£3	Nil	..	1/16 — 3/16	..	..
Do. 5 % Cum. Pref.	5	3	..	2⅜ — 2¾	+ 1/8	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	84½ — 86½ xd	..	5 1 8
Westminster, Ord.	5	10	9†	8⅞ — 9⅛	..	5 8 1
Do. 4½ % Cum. Pref... ..	5	4½	4½	5 — 5⅜	..	4 3 0

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅜	..	5 4 4
Calcutta, Ord.	5	8½	..	7⅝ — 8	..	5 6 3
Do. 5 % Pref.	5	5	5	4 13/16 — 5 3/16	..	4 16 5
Calgary Power, 1st Mort. Bds.	100	5	5	95 — 97	..	5 3 1
Canadian Gen. El. Com. ..	$100	7	7	120 —125 xd	+7	5 12 0
Do. 7 % Pref.	$100	7	7	118 —122 xd	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	8	..	¾ — 1	..	3 0 0
Do. 5 % Deb.	100	5	5	95 — 98 xd	+1	5 2 0
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	92 — 94	..	6 7 8
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	81 — 84	..	5 19 1
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	95½ — 97½	..	5 2 7
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 3/16	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	8 6 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	104 —106	..	4 14 4
Madras, Ord.	5	Nil	..	1½ — 2	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102 —105	..	4 15 8
Mexican El. Lt., 5 % 1st M. Bds.	...	5	5	87 — 89	..	5 12 4
Mexican Lt. & Power, Common	$100	4	4†	93 — 96	—1	4 3 4
Do. 7 % Cum. Pref.	$100	7	7	108 —111	..	6 6 2
Do. 5 % 1st Mort. Gold Bds.	..	5	5	94½ — 96½	..	5 3 8
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	86½ — 88½	..	5 13 0
Montreal, Lt., H. and Power ..	$100	8	9†	244 —249	+1½	3 12 4
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	39 — 42	..	..
River Plate, Ord.	Stock	10	..	240 —250	..	4 0 0
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	109 —114	..	5 5 3
Do. 5 % Deb. Stock	Do.	5	5	102 —104	..	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	98 —100 xd	—1	4 10 0
Shawinigan Water, Capital ..	$100	5	5	150 —154	—2	3 5 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107½ —109½	— ½	4 11 4
Do. 4½ % Per. Deb.	Stock	4½	4½	103½ —105½	— ½	4 5 4
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	99½ —101½	..	4 8 8
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	94 — 97	..	5 3 1
Victoria Falls Power, Pref. ..	1	11⅞d.	17/8d.	1 7/16 — 1 9/16	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	..	7⅛ — 7⅜	..	5 8 3
Do. 5 % Deb. Red.	Stock	5	5	96 — 98	..	5 2 0
American Telep. & Teleg., Cap.	$100	8	8†	147 —149 xd	..	5 7 5
Do. Collat. Trust	$1000	4	4	93½ — 95½	..	4 3 9
Anglo-American Telegraph ..	Stock	8	8	68 — 70	..	5 7 2
Do. 6 % Pref.	Do.	6	6	113⅜ —114½	..	5 4 10
Do. Def...	Do.	80/-	..	26⅜ — 26⅝	— ¼	5 12 8
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	7	8	7⅝ — 7⅞	..	4 8 11
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	82½ — 84½ xd	..	4 14 8
Cuba Telegraph	10	6	..	9½ — 10½	..	5 14 3
Do. 10 % Pref.	10	10	10	16½ — 17½	..	5 14 3
Direct Spanish Telegraph, Ord.	5	4	4†	3 — 3⅜ xd	— ¼	5 14 4
Do. 10 % Cum. Pref.	5	10	10	6⅛ — 7 xd	..	7 2 10
Direct United States Cable ..	10	5	4	7⅜ — 7⅝	— ⅛	6 7 0
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	130 —133	..	5 5 3
Do. 3½ % Pref. Stock.. ..	Do.	3½	3½	78 — 80	..	4 7 6
Do. 4 % Mort. Deb.	Do.	4	4	99¼ —101¼	..	3 18 10
Eastern Extension	10	7	7†	13½ — 13⅝	+ ⅛	5 1 10
Do. 4 % Deb.	Stock	4	4	99 —101	..	3 19 3
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98 —101	..	3 19 3
Globe Telegraph and Trust ..	10	6	6†	11 — 11½ xd	..	5 4 4
Do. 6 % Pref.	10	6	6	12⅜ — 13½ xd	..	4 10 7
Great Northern Telegraph ..	10	18	18	28¾ — 29¾	..	6 1 0
Indo-European Telegraph ..	25	13	..	57 — 59	..	5 3 5
Mackay Companies Common ..	$100	5	5†	87 — 91	..	5 9 11
Do. 4 % Cum. Pref.	$100	4	4	68 — 71	..	5 12 8
Marconi's Wireless Telegraph	1	20	..	4⅞ — 5	+ 1/16	4 0 0
Do. 7 % Cum. Partic. Pref.	1	17	..	4⅛ — 4⅜	+ ⅛	4 0 0
Monte Video Telephone, Ord. ..	1	6	..	1 1/16 — 1 5/16	..	5 6 8
Do. 5 % Pref.	1	5	5	1 5/16 — 1 7/16	..	5 6 8
National Telephone Def. ..	Stock	6	..	155⅛ —157⅛	+1	..
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	101 —102	..	4 8 8
Oriental Telep. and Elec. ..	1	8	..	1 3/16 — 1 7/16	..	4 5 4
Do. 6 % Cum. Pref.	1	6	6	1 3/16 — 1 5/32	..	4 18 5
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 9 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	10	10	10†	11⅜ — 11⅞	+ ½	8 8 6
Submarine Cables Trust ..	Cert.	6	6	129 —132	..	4 11 0
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99½ —101½	..	4 8 8
United River Plate Telephone	5	8	..	7⅛ — 7⅜	+ 1/16	5 3 3
Do. 5 % Cum. Pref.	5	5	5	5⅜ — 5⅝	..	4 8 11
West Coast of America	2½	2½	..	1 13/32 — 1 15/32	..	3 18 5
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	10	2½	..	3⅜ — 3⅝	+ 1/16	..
Do. 6 % Cum. 1st Pref. ..	10	6	6	10⅜ — 10½	..	5 10 4
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9¾ — 10⅛	..	5 17 0
Do. 5 % Debs.	100	5	5	101 —103	..	4 17 1
Western Telegraph, Ltd. ..	10	7	7†	13⅜ — 13⅝	+ ⅛	5 1 0
Do. 4 % Deb.	Stock	4	4	96½ — 98½	— ½	4 1 8
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	100 —103	..	4 7 5

* Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. ‡ 8s. in Funded Dividend Certs.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for		Closing Quotations Oct. 8th.	Rise + or Fall —	Present Yield p.c.
	*	1911.	1912.			£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil		..	Nil
Do. 5 % Pref.	1	5	5		..	6 8 1
Do. 4½ % Deb.	100	4½	4½	76 — 81 xd	..	5 11 1
Brit. Elec. Trac., 6 % Pref.	100	..	..	12 — 14	..	..
Do. Do. Deferred	100	..	..	6 — 8	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	89 — 92	..	6 10 5
Do. 7 % Non-Cum. Pr'f.	100	..	..	39 — 42	..	..
Do. 5 % Perp. Deb.	100	5	5	95 — 98 xd	— ½	5 2 0
Do. 4½ % 2nd Deb.	100	4½	4½	79 — 83	..	5 7 2
Central London Railway, Ord.	100	3	3†	77 — 7⅞	—1	3 16 0
Do. Pref.	100	4	4	84 — 86	..	4 13 0
Do. Def.	100	2	..	76 — 78	—1	2 11 3
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
City & South London, Ord.	100	1⅞	1½†	42½— 43½	+1	3 3 2
Do. 5 % Pref., 1891	100	5	5	107 —109	..	4 11 9
Do. Do. 1896	100	5	5	105 —107	..	4 18 6
Do. Do. 1901	100	5	5	105 —107	+1	4 13 6
Do. Do. 1903	100	5	5	104 —106	+1	4 14 4
Do. 4 % Deb.	100	4	4	99 —101	..	3 19 3
Dublin United Trams, 6 % Pref.	10	6	6	12 — 13	..	4 12 4
Great Northern & City, Pr'f. Ord	10	Nil	Nil	1⅞— 2⅛	..	Nil
Hastings Trams, 6 % Pref.	1	6	..	½— ⅝	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	69 — 74 xd	..	6 1 7
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2¼— 2⅜	..	4 11 0
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	81 — 83	..	6 0 6
London Elec. Railw'ys, 4 % Deb.	100	4	4	95 — 97	..	4 2 6
London United Trams, 5 % Pref.	10	Nil	..	5½— 6	— ½	..
Do. 4 % Deb.	100	4	4	73 — 77	+1	5 4 0

NAME.	Stock or Share.	Dividends for		Closing Quotations Oct. 8th.	Rise + or Fall —	Present Yield p.c.
	*	1911.	1912.			£ s. d.
Metropolitan Railway Consol.	100	1⅞	1½†	59½— 59¾	—1½	2 14 5
Do. Surplus Lands	100	2¼	2¾†	64 — 66	..	4 3 4
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 16 11
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	Nil	40½— 41	— ½	Nil
Do. 6 % Deb.	100	6	6	141 —143	..	4 4 0
Do. 4 % Deb.	100	4	4	95 — 97	..	4 2 6
Do. 4 % Prior Lien	100	4	4	99 —101	..	3 19 3
Do. 4½ % First Pref.	100	4½	4½	89 — 91	..	4 19 0
Do. 3½ % Gtd.	100	3½	3½	75 — 77	..	4 11 0
Metropolitan Elec. Trams, Ord.	1	6	5†	1 3/32— 1 1/32	+ 1/16	4 9 0
Do. Def.	1	Nil	..	1/32— 1/16	..	Nil
Do. 5 % Pref.	1	5	5	1/16— 1/8	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	97½— 99½	— ½	4 10 6
Do. 5 % Deb.	100	5	5	97½—100½ xd	..	4 19 6
Potteries, Ord.	1	5/8	..	3/16— 1/4	..	..
Do. 5 % Pref.	1	5	5	1/4— 5/16	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
South Metro. Trams, 6 % Pref.	1	6	..	1/16— 1/8	..	7 7 8
Do. 4 % Deb.	100	4	4	70 — 75	..	5 6 8
Underground Elec. Railways	10	..	..	4¼— 4⅜	— ⅛	Nil
Do. "A"	1/-	..	..	2⅜— 2⅝	..	..
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	1¾	£2	90 — 92	..	..
Yorkshire (West Riding), Ord.	5	Nil	..	1/32— 1/16	..	Nil
Do. 6 % Pref.	5	3	..	2⅜— 2½	..	4 9 0
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8 5

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	1½	4⅞— 5⅛	— ⅛	5 7 4
Do. 2nd Pref.	5	5½	1½	4⅛— 5 1/16	..	5 3 6
Do. 4 % Deb.	100	4	4	93½— 95	..	4 4 3
Do. 4½ % Deb.	100	4½	4½	100 —102	..	4 8 3
Do. 5 % Deb.	100	5	5	100 —102	—1	4 18 0
Auckland Trams, 5 % Deb.	100	5	5	103½—105½	..	4 14 9
Bombay Elec. S. & Trams, Pref.	10	6	6	11¼— 12	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	97 — 99	..	4 10 11
Do. 5 % 2nd Deb.	100	5	5	98 —100	..	5 0 0
Brisbane Trams Invt., Ord.	5	8	..	7¼— 7⅝	..	5 3 3
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	100½—109½	..	4 7 0
B. Columbia Elec. Rly., Def.	100	8	..	144 —149	—3	5 7 5
Do. Pref. Ord.	100	6	6	117 —120	—4	5 0 0
Do. 5 % Pref.	100	5	5	105 —108	—3	4 12 7
Do. 4½ % 1st Mort. Deb.	40	4½	4½	99½—102½	..	4 7 10
Do. 4½ % Vancouver Deb.	100	4½	4½	103 —106	..	4 5 0
Do. 4½ % Con. Deb.	100	4½	4½	101 —103	— ½	4 2 6
Calcutta Trams, Ord.	5	7	..	6⅞— 6⅞	..	5 3 8
Do. 5 % Pref.	5	5	5†	4 15/16— 5 1/16	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 8
Cape Electric Trams	1	2⅜	..	2⅜— 2⅜	..	..
City Buenos Aires Trams (1904)	5	5	5†	5⅛— 5¼	..	4 6 11
Do. 4 % Deb.	100	5	5	99 —102	..	4 18 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	95 — 99	..	5 1 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	..	3/32— 1/16	..	Nil
Do. 5 % A Deb.	100	5	5	86 — 91	..	5 10 0
Do. 6 % B Deb.	100	6	3	35 — 43	..	..
La Plata Elec. Trms, Ord.	1	Nil	..	3/32— 1/8	..	..
Do. Pref.	1	6	..	7/8— 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	..	1 1/32— 1 5/16	..	4 11 5
Do. 6 % Pref.	1	6	6	1 — 1¼	..	4 16 0
Do. 5 % Deb.	100	5	5	93 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb.	100	5	5	100 —102	..	4 18 0
Manaos Trams & Lt., 1st Deb.	100	5	5	92 — 95	..	5 5 3
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100½—102½	..	4 17 7
Mexico Trams Com.	$100	7	7†	124 —128	—2	5 9 5
Do. Gen. Con. 5 % Bonds	..	5	5	98 —100	..	5 0 0
Do. 6 % Bonds	100	6	6	101½—103½	— ½	5 16 6
Para Elec. Rlys. & Lt., Ord.	5	10	10†	7⅛— 7⅞	..	6 7 0
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	100½—102½	..	4 17 6
Perth (W.A.) Elec. Tr., Ord.	1	5	5†	1⅜— 1⅝	..	1 16 4
Do. 5 % 1st. Deb.	100	5	5	99 —102	..	4 18 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅜— 5⅝	..	5 4 4
Do. 4½ % 1st Deb.	100	4½	4½	97 — 99	..	4 11 0
Rio de Janeiro Trams	$100	5	5†	158 —163	—2	3 1 4
Do. 1st Mort. 5 % Bonds	..	5	5	101⅜—102⅜	—1¼	4 17 4
Do. 5 % Mort. Bonds	100	5	5	97⅞—98⅜ xd	—1¼	5 1 3
Sao Paulo Tram, Lt. and P.	$100	10	10†	275 —285	— 5	3 10 2
Do. 5 % 1st Deb.	$500	5	5	104 —106	— ½	4 14 4
Singapore Trams, 5 % Deb.	100	5	5	82 — 85 xd	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	7	..	5⅝— 6⅛	..	5 14 3
Do. 6 % Pref.	5	6	..	4⅞— 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	101 —104	..	4 16 2
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	101½—103½	..	4 7 0

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	3/32— 1/8	— 1/16	8 0 0
Do. 6 % Pref.	1	6	6	1/16— 1/8	..	7 7 8
Babcock & Wilcox	1	28	..	3⅜— 3⅝	— 1/16	4 2 10
Do. Pref.	1	6	6	1 3/16— 1 5/16	..	3 16 10
British Aluminium, Ord.	1	Nil	..	3/32— 1/8	..	..
Do. 6 % Cum. Pref.	1	Nil	..	3/32— 1/8	..	..
Do. 5 % Prior Lien Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	85 — 88	..	5 18 8
B.I. & Helsby Cables	5	10	8†	7⅛— 8 xd	+ ⅛	6 5 0
Do. Pref.	5	6	6	5⅞— 6⅛	..	4 14 1
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 96	..	4 13 9
British Westinghouse, Pref.	8	Nil	Nil	1/16— 1/8	..	Nil
Do. Deb.	100	4	4	60 — 63	..	6 7 0
Do. 6 % Prior Lien	100	6	6	99 —102 xd	..	5 17 8
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	75 — 80	..	6 5 0
Do. 4½ % Deb.	100	4½	4½	50 — 55	..	8 3 8
Do. 4½ % Second Deb.	100	4½	4½	35 — 40	..	11 5 0
Callender's Cable	5	15	..	10½— 11	..	6 16 4
Do. Pref.	5	5	5	4½— 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	99½—101½	..	4 8 8
Castner-Kellner	1	20	15†	3 1/32— 3 1/16	..	5 1 7
Do. Deb.	100	4½	4½	103 —106	..	4 5 0
Crompton & Co.	3	Nil	..	⅛— ⅜	..	Nil
Do. Deb.	100	5	5	56 — 66	..	7 11 8
Dick, Kerr	1	5	Nil	⅛— ⅜	— 1/16	..
Do. Pref.	1	6	6	1⅛— 1 1/16	..	5 13 0
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £3 paid	5	Nil	..	1/32— 1/16	..	Nil
Do. fully paid	5	Nil	..	1/8— 2⅛	..	Nil
Do. 4 % Deb.	100	4	4	64 — 68	..	5 17 8
Do. 5 % Second Deb.	100	5	5	72 — 75 xd	..	6 18 4
Electric Construction	2	2½	3¾	¾— 1	..	7 10 0
Do. Pref.	2	7	7	1⅜— 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7½— 8	..	8 5 8
Do. Deb.	100	5	5	92 — 94	..	5 4 2
General Electric, Pref.	10	5	5	10 — 11	..	..
Do. Deb.	100	4	4	90 — 95 xd	..	4 4 3
Henley's, Ord.	5	17	5†	12½— 13	..	5 15 5
Do. Pref.	5	4½	4½	4¾— 5⅛	+ ⅛	4 7 10
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
India-Rubber, G. & T.	10	..	..	11½— 12½	..	..
Do. Pref.	10	5	5	9⅝— 10⅝	..	4 17 7
Telegraph Construction	12	17½	5†	34 — 36	..	6 13
Do. Deb.	100	4	4	98 —100	..	4 0
Willans & Robinson	1	Nil	..	1/16— 1/8	..	Nil
Do. Pref.	5	Nil	..	⅛— 1	..	Nil
Do. Deb.	100	4	4	58 — 60	..	6 13

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 4 per cent. August 29th, 1912.

ELECTRICAL FITTINGS AND THE LAW OF LANDLORD AND TENANT.

[FROM A LEGAL CONTRIBUTOR.]

Questions frequently arise as between landlord and tenant as to the ownership of electrical fittings. A tenant who incurs the expense of fitting out an old house with a complete electrical installation not unnaturally resents the complete annexation of all the fitments which he has himself purchased, while the landlord, relying on the ancient maxim *quicquid plantatur solo solo cedit*, asserts his rights as owner of the soil by saying that whatever is annexed to the house or building must of necessity become his property.

It may be convenient to discuss this question from the severely practical point of view by considering the legal bearing of certain cases which must be of comparatively frequent occurrence; but before proceeding to consider the particular cases, it may be well to understand the general principles of law by which fixtures become vested in a landlord. The consideration whether the article is essential to the enjoyment of the premises on the one hand, or whether it is a mere convenience on the other, is a material element in deciding the character of the annexation as being complete or incomplete respectively. There are, however, certain articles which are removable as between landlord and tenant which have so become removable by custom, having regard to the reason of the *purpose* for which such annexation was made. Amongst these are certain articles of trade, agriculture, ornament and convenience. The reason for the relaxation of the general rule in respect of these articles seems to be founded on the essentially temporary purpose for which the annexation is designed, and on the inconvenience which would arise to tenants if, by every slight attachment to the freehold, the landlord should obtain the absolute property in the article annexed. The privilege in the case of ornaments seems to be of a more limited nature than that in respect of trade fixtures. Thus it extends only to articles which are perfect chattels in themselves—and which serve for the most part as substitutes for mere movable furniture—and not to things such as conservatories or glass houses in the nature of a building or erection, though of a temporary character and easily movable. The right of removal in any particular case depends on the particular circumstances, and all that can be said in a general way is that such right *may* be defeated either from the mode of the annexation, or from the permanent nature of the purpose for which the annexation was made (as showing that the fixture is essentially a part of the building), or from the physical injury to the freehold which would be likely to result, if the injury caused by removal would be one of a substantial nature.

Applying the foregoing principles to the solution of the problem in hand, it will be seen that electric fittings, though, *primâ facie*, some of them may be fixtures, must to a certain extent be treated as removable. Roughly speaking, the line appears to be drawn in practice between those parts of an installation which are necessarily of a permanent character, and those parts which may be altered to suit the fancy of a particular tenant. Regard must also be paid to the extent to which any particular article is affixed to the freehold. It is obvious, for instance, that wires embedded in the plaster of a wall could not by any stretch of the imagination be regarded as a fixture which a tenant was entitled to remove. It would be as fair to say that a gas pipe put in by a tenant as part of a lighting system did not become the property of a landlord. On the other hand—to go to the other extreme, it is clear that a mere incandescent lamp could not possibly be looked upon as the property of the landlord.

It is somewhat remarkable that the only case which throws any clear light on the subject is one in which it was held that gas fittings do not vest in the landlord. There appears to be no reported decision on the subject of electrical fittings, and the questions relating to them must be answered by having recourse to first principles.

It is now proposed to deal with certain concrete cases :—

(*a*) A tenant wires a house which he holds under a lease for years. Do the wires vest in the landlord at the end of the term?

It is clear that in this case the wires and the casing of the wires vest in the landlord, and could not be removed by the tenant unless pursuant to special powers conferred upon him by his lease. A tenant would be liable if he attempted to remove the wires.

(*b*) A landlord wires a new house, and the tenant puts in switches, distribution boards, and lamp brackets. Can he remove them at the end of his tenancy?

With regard to switches and distribution boards, these appear to the writer to fall within the category of articles which are of a permanent character, and would have to be used in practically the same form in relation to any installation. At any rate, he would be sorry to advise any tenant to remove them only to leave blank spaces on the wall to which they were affixed. With regard to lamp brackets, these appear to fall within a different category. They are often fanciful in design and very expensive. They can be removed without doing damage, often by the mere turn of a screw. In these circumstances, it appears to be clear that they are tenant's property, which he can remove at will.

(*c*) A tenant puts in a transformer at his own cost and expense. Does the transformer vest in the landlord?

With regard to a transformer, this appears to be a separate instrument, which would clearly be easily detached, and must, in the writer's view, be treated as a tenant's fixture, which he can remove.

(*d*) A tenant puts in ceiling roses, made of metal or porcelain, and wall sockets. Do any of them belong to the landlord?

Ceiling roses appear to be very much on the border line, but it would seem that, inasmuch as they are generally ornamental objects, they should be treated as tenant's fixtures. It is probable that in case of a dispute, a reasonable landlord would agree to treat an ornamental rose as the property of his tenant and the ordinary white roses as landlord's fixtures. As to a wall socket (*i.e.*, the part into which the plug is fitted), it is conceived that this would be a tenant's fixture, as it might easily be removed and replaced by a permanent connection to a wall or bracket lamp.

(*e*) Assuming a tenant installs electric light throughout a house, can any action be brought against him by his landlord, if on finding that the landlord refuses to pay anything towards it, he deliberately cuts or damages the wires without defacing the decorations?

It is clear that if a tenant does any damage, whether by removing landlord's fixtures, or improperly removing his own, he can be held liable to make it good. The ordinary covenant to repair, and leave in repair, would clearly impose such a liability upon him.

THE ELECTRIC DRIVING OF WASHING MACHINES.

[COMMUNICATED.]

In the search for new day loads, the central station engineer cannot afford to neglect the possibilities of electric driving of washing machines (of the drum and centrifugal types), wringing machines and other laundry machines used in large and small houses. Electric motors have already been considerably employed in this connection in America and in Germany. The machines in question offer a fairly steady day load during the time they are in use, but in private-house installations it is naturally usual to carry out laundry work during the early part of each week, and the central station could count on little laundry demand in such cases after, say, Wednesday. Electrically-driven washing machines are, however, most likely to be installed by large houses and in common washeries attached to blocks of flats, &c., and, particularly in the latter case, there is likely to be a considerable demand throughout the week. Where public wash-houses, or wash-houses attached to blocks of flats, are concerned, the reduction in the time occupied in performing a given amount of washing where electric motors are employed offers a valuable solution to the present overcrowding difficulties experienced during the early part of each week.

The labour-saving and hygienic merits of electric driving in this connection are obvious and are very considerable, even

as compared with hand-driven washing machines. In the smaller installations it is generally convenient to place the motor at the foot of a pedestal carrying the countershafting and pulleys necessary to drive the machines employed. In any case, it is necessary to make allowance for the damp atmosphere in which the motor works, and, in the case of a motor fixed on the ground level, the machine must be totally enclosed and waterproof. It must also be remembered that any complex mechanism is here out of place, for it will receive little skill in usage and less care in maintenance. Gearing and belting must be so enclosed that there is no risk of soiling or damaging clothes or more serious accidents.

A well-known German firm gives the following estimates of the cost of washing by hand alone, by hand-driven machines and by an electrically-driven equipment. It is assumed that the clothes to be used weigh 220 lb. when dry; this total is made up as follows:—20 bed covers, 45 lb.; 20 sheets, 40 lb.; 40 pillow cases, 25 lb.; 100 handkerchiefs, 33 lb.; 90 serviettes, 29 lb.; 20 table cloths, 26 lb.; 25 shirts, 22 lb.

The proportions of this "wash" are rather peculiar and show an extraordinary shortage of underlinen, but this does not affect the following data:—

	s.	d.
By hand.—		
22 lb. bar soap, at 4d.	7	4
11 lb. soda	0	6
220 lb. coal	2	6
Two washerwomen, two days	8	0
Board " "	4	0
	£1 2	4
Hand-Driven Washing Machines.—		
11 lb. of powdered soap	3	0
110 lb. of coal	1	3
Two washerwomen, one day	4	0
Board " "	2	0
	10	3
Electrically-Driven Washing Machines.—		
11 lb. of powdered soap	3	0
110 lb. of coal	1	3
¼-H.P. motor, 3 hours; 0·9d. unit at 5d.	0	4½
	4	7½

A similar comparison by Ritter, based on a test carried out with the monthly "wash" from a household of four persons, is as follows:—

	s.	d.
By Hand.—		
One washerwoman, for 1½ days	4	6
Board " "	2	3
Maid servant (no extra wage)	0	0
Coal	2	0
8 lb. of soap, &c.	2	9
	11	6
Maid Servant occupied 8 hours.—		
Energy cost (lighting tariff)	0	3
Coal	0	10
5 lb. soap, &c.	1	11
	3	0

The cost of the same amount of washing sent to a laundry would be 25s. 6d.

The above comparisons show a large direct saving in favour of electric driving (even when using electricity supplied at lighting rates); the saving is sufficient to cover the capital cost of the installation in a year or two at the most. Further obvious advantages of electric driving include reduced manual labour, healthier conditions and better appearance of clothes.

As a rule it would be possible to arrange for the supply of the necessary motors at power rates, and the energy bill then becomes negligible, and the only items of importance are the cost of soap and coal. The cost of soap is practically irreducible, assuming full advantage to be taken of the various modern cleansing agents, but there is a considerable field of application for electric heating in place of coal or gas. Where a house has a central water heating boiler, the various vessels can be filled from the hot-water pipes, and brought to and maintained at boiling point by electric heating elements. There is no reason why an electric water heating plant of 100 per cent. load factor should not be installed in public wash-houses, and in wash-houses common to blocks of tenement dwellings, &c., smaller heating elements being employed to keep the water boiling during its use in the various vessels. Electric heating allows of accurate heat control and maximum cleanliness, and enables vessels to be located in any convenient spot, but, as a rule, gas heating of the "copper" and other vessels is more economical, practically as convenient, and, in this service, as safe as electric heating, though lacking the hygienic merits of the latter. In the power application mentioned, gas cannot at all compete with electrical energy.

A FEW REMARKS ON COOKERS.

By E. P. AUSTIN, A.M.I.E.E.

The attention that is being focused on the electric cooking and heating load and its developments will, no doubt, result in the consumption of energy for domestic purposes forming one of the principal items of the central station output.

The question presents different aspects, depending entirely on the social life or conditions of any particular district or community. There is already much information available relating to this subject as far as residential flats and suburban districts in and around London are concerned, but the greater number of provincial supply engineers are still feeling their way in the matter, being much exercised in their minds on such questions as the effect on mains and services, choice of apparatus, overlapping the peak, and, in natural sequence, the tariff.

The practicability, and in many respects the superiority, of electric cooking has long been well established, but the reliability of the apparatus is still a matter of doubt in some people's minds. That such misgivings are only the remnants of prejudice, germinated by unpleasant experiences of comparatively remote date, is very evident from, amongst other things, the manufacturers' substantial guarantees, the quantity of apparatus sold, and the excellent results obtained in many towns.

Any lingering misgivings a person may have respecting reliability would be quickly dispelled by a tour of the manufacturers' workshops.

The writer recently had the privilege of visiting some of the principal firms who make cookers and heaters, and of inspecting their goods in all stages of manufacture and test, and was much impressed by their robust construction and the ingenuity displayed in the design and application of various standard heating elements.

The choice of apparatus is governed by the capacity of distribution mains and services and the size of the houses to be equipped. In many provincial towns, the bulk of the domestic supply will be for houses ranging between £20 and £35 per annum rent, where the house-wife does most of the cooking for a small household, and consequently desires more than anything else cleanliness, comfort and quickness from the cooking apparatus. For such houses the maximum demand should be as low as is consistent with good work, the apparatus simple and robust, for however much an ingenious device may appeal to a man, a woman will not take more than a passing interest in tools that are not essentially useful to her.

A very useful article is the electric grill, arranged so that it can efficiently perform two operations simultaneously. It should reach working temperature in about 30 seconds, without waiting for a mass of metal to become heated up. Thermal storage is not required in this class of apparatus, since they are used largely in preparing breakfast, and the knowledge that a stove will cook after the current has been switched off is not much consolation to a man who has missed his early train through waiting for his breakfast. For quick work and general utility an outfit comprising a grill, boiling plate, and self-contained water-boiler has a wide range of usefulness.

The self-contained utensil has much to recommend it for speed and efficiency, and its development along lines that allow of its immersion in water for thorough cleansing will do much to keep down the maximum demand.

In any case a self-contained kettle or saucepan should form part of a cooking outfit, for boiling small quantities of water quickly.

For larger work than can be performed by the previously-mentioned articles there are many useful patterns of complete cookers to choose from, although some of the types have formidable maximum demands. Many original designs are used, but the majority of cookers follow the lines of the familiar gas cooker, since a certain standard of convenience has been set up. In fact, many electric cookers are built up from gas-oven patterns with the necessary adaptation and improvement of internal arrangements required by electrical methods.

For the type of house mentioned above, a cooker outfit with a maximum possible demand of 2,500 to 3,000 watts is all that should be installed. For families comprising six or eight persons, a cooker of 4,500 watts' capacity would probably be required. These ratings do not of course apply to the oven alone, but include all hot plates and grill.

Although there are many ingenious designs of breakfast cookers obtainable, the initial outlay is in almost every case higher by far than that required for a corresponding gas or oil cooker. For instance, an electric cooker with two heating elements, one for a small closed space for roasting with there regulations, and one for grilling and boiling on top, can be sold retail for about £4 10s. A similar gas cooker can be bought for 25s. to 30s. Comparisons between other types of cookers give much the same result, but not so marked in the larger domestic cookers, and when the constructions are compared there seems to be a large margin for the additional cost of assembly and heaters, which latter can generally be renewed when necessary at a small cost.

There is at least one grill on the market that boils fairly quickly and grills and toasts excellently at the same time, that can be sold at £1 complete. The majority cost from 10s. to 15s. more than this, retail. As far as the writer has been able to ascertain, this is the cheapest article on the market, considering its usefulness. Its principal drawback, common to all similar apparatus, is the length of time required to boil; but when other operations are carried out at the same time, the drawback is not felt, and the cooker is very efficient.

Supply engineers must look to a large number of consumers using electric cooking and heating at small individual consumption for the bulk of the domestic purposes output, rather than a few consumers with large consumptions.

The applications should be rendered as popular as possible, and not treated as a sort of luxury. The more popular electric cooking becomes, the more diverse will be the load, particularly in the smaller towns, where dining late is the exception.

The advantage, from the load-factor point of view, of reaching the small householder is more apparent in the North and North Midland towns than in the South, for in these districts the midday meal time is extended over a longer time due to many works, &c., stopping at 12 noon and a large number of business houses and offices adjourning one hour later.

Popularising the smaller apparatus will do much to raise the load factor, and many engineers are on the lookout for an efficient boiling plate with substantial connecting arrangements that will sell at about 12s. to 14s. to the consumer. There are excellent plates at the price, but the method of connection is always faulty, except in one or two cases of high-priced articles. A hot plate should have a tubular metal handle, with the cable passing through it well beyond the reach of spilled liquids, &c. Heat regulation should be done by means of switches, as the three-pin method is dangerous, particularly in a house where there are children, who will most certainly get a shock from such a device at some time or other.

Most towns now supply heating units at 1d., and it only requires a cheap line of fool-proof cookers to accelerate the popularity of electric cooking.

There are, as indicated in the foregoing, some reasonably priced devices, and improvements in the connections of these would be more welcome than a reduction in price.

There have recently appeared on the market some useful designs intended to act as incentives to consumers to use more ambitious apparatus. The makers are inclined to be optimistic in their claims for the capabilities of these things, and it is well for electricity supply people to act cautiously in this direction, or a device excellent in its way may produce a wrong impression on a consumer through injudicious description.

Radiators and convectors are more reasonable in price than cookers, but are at present likely to prove a little costly for heating large rooms. Their great advantages in other directions are well known. The position in a room is an important point, and they should not be used directly in front of an open fireplace. The hot air does not, as a rule, pass up the chimney, as the chimney is cold; but a cold draught comes down the chimney and brings soot with it, to be deposited on the walls by the heated air from the radiator. This remark applies equally to other forms of radiator as well as electric appliances. Low temperature convectors with large elemental heating surface give the most pleasant results, as the heated air is not excessively dried, and is evenly distributed about the room,

The cheapest article on the market is the electric iron, and this is no doubt due to the competition in that direction, and the large quantities sold.

Incidentally, the methods of connection are generally better than the existing hot-plate connection. Several makes that can be sold at 9s. 6d. complete, or a little less, leave little to be desired, and are certainly better for their purpose than anything else on the market of any system.

Since the above lines were penned, several makers have come forward with well-constructed boiling plates with complete protected cables and control switches at prices that admit of hiring out, as a demand has now arisen for what Mr. Sankey has termed the "electric gas ring."

PROCEEDINGS OF INSTITUTIONS.

Rolling-Mill Practice in the United States.

By J. Puppe, D.Ing. (Breslau).

(*Abstract of paper read before the* Iron and Steel Institute, *October*, 1912.)

Early in 1911 the author visited the majority of those ironworks of the United States where typical American rolling-mill practice is followed, for the purpose of studying the latest methods and improvements.

Amongst other features observed, a striking difference between German and American practice was the rate of diminution of the draught of cogging rolls. Whereas in Germany a reduction of 14 per cent. is hardly ever exceeded, and with harder material an average of 11 to 12 per cent. reduction is the rule, the reduction in the draught from one groove to the next often amounts to 20 per cent. in American practice. The roughing rolls of the rail mill at Lackawanna even give an average reduction of 24 per cent. per pass in the first six passes. How far the structure and quality of the material suffer in the case of rails is a question which will be discussed further on.

The shortness of the rolling period is further accounted for by the manner of controlling the auxiliary engines, which now very generally consist of electric motors. The controllers are operated with very short levers with short ranges, and there are only three notches, "stop," "forwards," "backwards," with no intermediate steps.

It appears that American cogging mills differ considerably from German ones both in point of construction and design and also in the method of working; the high rate of production is chiefly rendered possible by the very much simpler plan of rolling, which consists in rolling to larger sections, thus shortening the rolling period, and by the rapid and accurate handling of the auxiliary engines.

When a single rail mill, such as that at the Edgar Thomson works or at Gary, turns out from 3,500 to 4,000 tons in 24 hours, it is a question whether that amount of care is bestowed on the work which is desirable in view of the great importance of obtaining the requisite high quality in the finished rails. This supposition would seem, to some extent, to be confirmed by the fact that rail breakages on American railways are of much more frequent occurrence than in Europe, notwithstanding that, for a long time past, various commissions of rail manufacturers and consumers have been investigating the causes of this trouble, and have endeavoured by various means to improve the quality. It must be admitted that the conditions of railway service in the United States are far more severe than with us, and that the loads and speeds have been very much increased since the eighties. The risk of breakages must have increased considerably, especially in view of the low temperatures sometimes prevailing during the winter months.

Proposals for the improvement of the structure of the metal by lowering the temperature at which the rails were finished, and a specified permissible maximum contraction, have not proved a sufficient remedy in increasing the resistance to shock and jarring. In 1903, the Rail Commission of the American Society of Civil Engineers received a pronouncement from a railway engineer-in-chief as follows: "The combining of the rail-rolling mills has resulted in a continuous deterioration of the rail material, and every effort must be made to counteract this tendency."

The question whether the number of rail-breakages are due to inferior quality resulting from the rapid production on a large scale in conjunction with the acid Bessemer process, which has long held the field, or are to be attributed to the severe conditions of service, is one which is not yet solved. The fact is, however, noteworthy that the production of rails of special steel is now continually on the increase in the United States, and there has of late been a considerable decline in the output of acid Bessemer rails.

It is also noteworthy that at the Indiana Steel Co.'s works at Gary, open-hearth furnaces alone have been decided upon, from which it is clear that American railway engineers prefer open-hearth to acid Bessemer steel rails. At the same time, the increase in the production of open-hearth rails is also in some respects due to the increasing scarcity of suitable ores for smelting Bessemer pig.

Naturally the treatment during rolling has a particularly important influence on the rail quality. The initial and final temperatures, the cross-section and length of ingot, the proportion of initial and final section to the number of passes, the roll draughting and the treatment of the finished rails, all play an important part.

It is clear that it cannot be immaterial whether a comparatively hard material is rolled down to its final shape in 30 passes with a reduction of 12 per cent. in section at each pass, or in 15 passes with a 23 per cent. reduction. The finishing temperature is bound to be enormously influenced by the number of passes and the reduction of draught; moreover, the structure of the steel, especially at the lower temperature required in the case of the harder kinds, suffers through the too severe squeezing of the metal.

Comparative figures for American and German rail-rolling mills show a much greater uniformity in favour of the latter, which entirely confirms the foregoing considerations. The German figures besides show a smaller average reduction of draught for the roughing passes and all the succeeding passes.

At the rail mill of the Indiana works it may be mentioned that the ingot section is 20 × 24 in., and it is rough rolled in nine passes to about 8 × 8 in., and finished off in nine more passes without reheating. The average reduction of draught in the first nine roughing passes is 21 per cent., which must be regarded as very high; in German roughing mills 15 to 17 passes would be required for this work. The shape of the grooves indicates the tendency to reach the finished profile as soon as possible, and the reductions of section are very considerable.

A New Type of Large Gas Engine.

By Alan E. L. Chorlton, M.I.Mech.E., A.M.I.E.E. (Manchester).

(*Abstract of paper read before the* Iron and Steel Institute, *October*, 1912.)

The theoretical economical advantages of large gas engines as prime movers are so well known in this country, particularly when using the waste gases from either blast-furnace or coke ovens, that some explanation must be sought to explain the relatively slow progress which has taken place in their use when compared with that on the Continent, especially in Germany. The importance of these economies, as affecting cost of production, is probably greater for the iron, steel and coal industries than for any other, and is of such obvious moment that the disadvantages of the gas engine that are held to exist in this country, as compared with Germany, must be of very real significance indeed to account in anywise for the relatively small extent of their usage in these industries.

The limitations which have prevented the progress of the large gas engine are primarily due to—

(*a*) The prevalence of the belief of unreliability.

(*b*) The comparatively high total first cost of installation.

This view of unreliability has, of course, been formed from the troubles experienced in the past. It may be said constructionally to refer to the cracks and breakages of important parts of the engine (undoubtedly a too common occurrence in the past).

Generally, these troubles sprang from initial foundry strains set up between the inner and outer walls of the casting when these were cast in one piece, as was the original practice. These initial strains, augmented by those set up through the different temperatures of the parts when working, eventually caused cracks and failures. This more than ordinary occurrence of cracks compelled makers first to discover the reason and then to amend their designs to prevent them; and the final forms of all types had the inner and outer skins of metal connected only as far as possible in one place, the other ends being left free to allow all the differential expansion and contraction set up in the foundry and in working to take place freely. A flexible connecting membrane completed the jacket to retain the cooling water in place.

From the practical point of view, it appears that the cylinder should have no valve pockets, that is, it should approximate to a simple pipe, and that the jacket should be a separate casting.

The next source of unreliability is in the valves and valve gears, subject to the heat and stress of the explosion. This is a frequent cause of failures in all prime movers. Obviously, therefore, an improved engine should, if possible, be valveless; have cylinders of simple pipe form; and have separate jackets.

The only large engine with cylinders of pipe form without valve pockets, &c., and where the two pistons perform the various valve functions successfully, is the Oechelhaeuser; the disadvantages of this type, which have restricted its use, although its thermal economy is well known, spring from other causes, as high first cost, large floor area covered (horizontal type), &c.

The success of a valveless action was confirmed by the author's English experience with the working of the central exhaust ports by the piston in the Körting type of engine—an experience which clearly indicated that there was no apparent reason why the air and gas inlet to the cylinder should not be controlled by a similar method in an adjacent cylinder. The outcome of this was the adoption of two parallel cylinders, with ports about the middle, connected by specially shaped passages at their ends; one piston thus controlling the inlet through the ports in one cylinder, and its fellow expelling the exhaust through a similar set of ports in the other cylinder. This design was more or less bound to be of the two-cycle type, and he naturally leaned to such a principle, seeing that his experience had convinced him that by retaining, amongst other things, small cylinder diameters, it was the most suitable form for large powers.

From fig. 2 it will be seen that the cylinder consists of two single-walled "U" tubes placed end to end, the inlet and exhaust ports being about the joint; flanges on the cylinders—set back somewhat from this juncture—hold in between them the exhaust and inlet boxes.

The whole cylinder unit presents extremely simple forms of single-walled castings, particularly suitable for successful and economical foundry work without setting up casting or expansion strains, and also for use in internal-combustion work itself, as

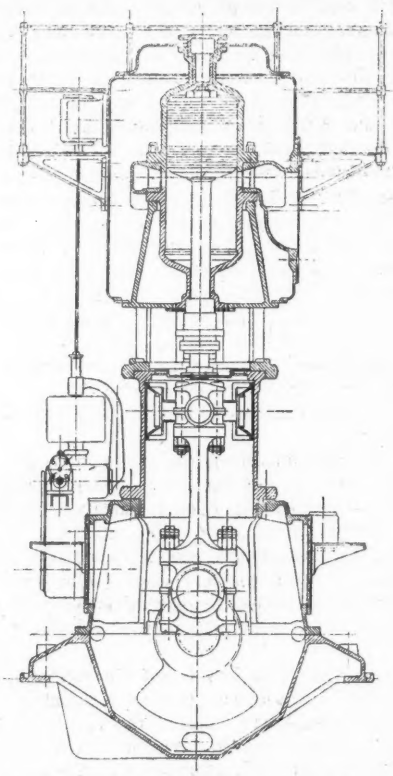


Fig. 1.—"Duplex" Engine (Transverse Section).

there are no pockets or irregular shapes; all sections are more or less cylindrical, including the connecting passages. No heavy flanges or joints occur about the points of maximum pressures and temperatures as in the ordinary type of engine. This form gives most effective cooling to all parts, as, being inherently of a strong section, they can be made with comparatively thin walls. The efficiency of the cooling is further increased by the accessibility of the water to all parts of the combustion chamber, the usual thick flanges and joints there being avoided. Thus, the engine may run at a higher temperature than is usual in the present large sizes. In fact, on test, full load has been maintained continuously with the jacket water boiling, and under such conditions the amount used can be considerably reduced (allowing in some cases the motor-car type of cooler to be used, with its advantages of small space occupied, &c.). Further, the absence of joints and cavities in the combustion chamber reduces the risks of pre-ignition, and improves the efficiency of scavenging. High compression can be used without the disadvantages of water injection.

All the cylinder, &c., walls being single, the jacket must be provided in a suitable manner to retain the necessary water, and this is most readily done by dropping the whole "Duplex" cylinder into a simple tank, as shown in fig. 1, the cylinders resting by their central flanges on stools on the tank bottom or engine entablature. By this construction is secured at once complete allowance for temperature expansion without restraint; the exhaust outlet, the only connection to the outside, passes through the tank wall by a stuffing box, or a flexible membrane is used. the connection to the charging pumps being within the jacket tank. It will further be seen from this design, that in casting complete expansion is allowed in all directions, and no strains are set up, all the cylinders, &c., being single-walled. Difficulties with valves are done away with, for though these are now much rarer than in the

past, still the exhaust valve of all four-cycle engines remains a part requiring considerable attention. No doubt the present large horizontal gas engines with their simplified valve gear are a great improvement over the previous types; still the further great advantage of an engine with no valve gear must be apparent, particularly when taken into account with the possibilities of higher rotational speed.

There still remains the disadvantage of heavy capital outlay when the present large engine of the horizontal type is considered.

For large powers the present comparatively slow-speed horizontal is the only one in the field, and the large amount of room taken up by this type, with its expensive foundations, &c., is well known. The cheaper prospect, judging from steam usage, and some work already done in medium-powered gas engines, is in the vertical design.

The reduction in cost effected by installing the large vertical "Duplex" type as against the present horizontal engine is 20 per cent.

The engine may run at considerably increased rotational speed, and from the fact that there is a compression on each stroke of the two-cycle engine balancing the inertia of the reciprocating parts, a higher piston speed than is usual can thus be adopted with the attendant thermodynamic gain.

Ordinary air and gas-charging pumps driven by an auxiliary eccentric are provided at one end, within or alongside the tank, and connect direct to the inlet valve box of one cylinder. The "Duplex" power cylinder is so arranged that the exhaust piston

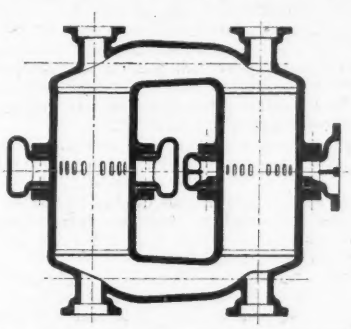


Fig. 2.—Section of "Duplex" Cylinders.

has a lead over the inlet piston. The governor is gear-driven, and acts on a simple control valve on the pumps. The ignition is of the rotary magnetic high-tension type in duplicate. The other details of the engine construction are similar to standard high-speed steam engine practice.

In order to indicate the large powers for which these engines can be built, the cylinder dimensions of a vertical twin "Duplex" of 6,000 B.H.P. may be noted (fig. 1). These cylinders are but 36 in. in diameter × 43 in. stroke, and the speed of revolution is 140 per minute. The fly-wheel is 12 ft. 3 in. in diameter and 60 tons in weight, and the floor space taken up by the engine is 475 sq. ft.

These sizes are by no means the limit, and the author sees no reason why cylinders of 48 in. diameter should not be successfully used. A triple "Duplex," with 48-in. diameter cylinders and 4-ft. stroke, running at 125 R.P.M., would give about 16,000 B.H.P. at quite a moderate mean pressure. The moving parts under explosion stress for engines of equal turning moment, "Duplex" and four-cycle horizontal, number respectively 4 and 20.

Horizontal Engine and Vertical Duplex Engine with Equal Numbers of Impulses per Revolution.

Twin tandem four-cycle horizontal.		Twin duplex two-cycle vertical.	
Cylinders	4	Two duplex	4
Pistons	4	Pistons	4
Inlet valves ...	8 with gear.	Inlet valves	None.
Exhaust valves ...	8	Exhaust valves ...	None.
Piston rod packing	8	Piston rod packing ...	4
Total	32	Total	12
Total moving parts subject to heat stress—20.		Total moving parts subject to heat stress—4.	

Recovery of waste heat from the exhaust is an interesting part of the internal-combustion engine problem, and one in which the author has had considerable experience with large horizontal engines of the two-cycle type. The results obtained in the way of evaporation with this type, where the proportion of heat discharged by exhaust to jacket is greater than that of four-cycle engines, have been as high as 3 lb. per B.H.P.-hour, the boiler being fed with hot feed from the jackets and economiser pipes.

The steam generated in these boilers can be used in various ways. When the source of the gas is an ammonia-recovery producer plant, all that is evaporated will be required for the producers to keep the temperature down. The value of the steam generated, 0·02d. per B.H.P.-hour, is equivalent to the value of the gas taken by the engine with the present price of by-products; thus the gas engine need not be debited with the gas used, and consequently the cost per B.H.P.-hour generated is extremely low. On electrochemical work, with 100 per cent. load factor, the net cost of energy for a 3,000-B.H.P. plant is 0·047d. per B.H.P.-hour, assuming interest and depreciation at 10 per cent.

In other cases, the steam can be used for power purposes, driving a steam auxiliary cylinder on the main engine. Or it may be used for any auxiliary plant, such as water pumps, or charging pumps, when these may be separately driven. These exhaust boilers act as very effective silencers.

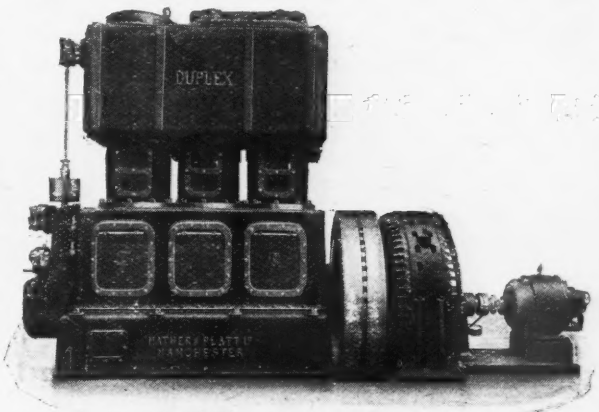


Fig. 3.—"Duplex" Gas Engine and Electric Generator.

A standard high-speed engine of the vertical "Duplex" type, upon which very exhaustive tests have been made on the shop test plate, gave the following figures:—

Mechanical efficiency	...	85 per cent.
Heat consumption per B.H.P.-hour	...	10,500 B.TH.U.
Water consumption per B.H.P.-hour	...	4 gallons.
Oil consumption per B.H.P.-hour	...	0·0004 gallon.
Governing, full load on and off ...	...	1½ per cent. rise—steady afterwards.

These results are from cylinders 15½ in. in diameter by 18 in. stroke, and will doubtless be improved upon with larger cylinders and further refinements.

The first engine built was running on load in parallel with other gas sets within two hours of its first starting up on gas, a result that with a new type of gas engine is without precedent.

The Magnetic Properties of Manganese and Nickel Steels.

(*Abstract of papers read before the* Iron and Steel Institute, *October*, 1912.)

Dr. S. Hilpert (Charlottenburg) and Dr. W. Mathesius (Worcester, U.S.A.) read a paper on this subject. As the result of tests on various nickel and manganese steels, the authors find that in all the steels the magnetisability after quenching from 1,200° C. was greatly increased, as compared with that of the same material after similar treatment at lower temperatures, and also after slow cooling. By means of systematic thermal treatment in combination with magnetic measurements, it has been found that at high temperatures (above 1,050° C.) substances are formed which at ordinary temperatures are strongly magnetic, but in spite of quenching cannot be obtained in a pure state.

All the steels, with the exception of nickel steel with 31 per cent. of nickel, showed both in the quenched and in the slowly-cooled specimens an increase in the magnetisability when annealed at temperatures between 400° and 450° C. This is not, in any case, an ageing phenomenon, but is the result of a new state which is obtained only by a heating process. In general, it has been shown that the question whether the heat treatment has been carried out under a rising or a falling temperature has a decisive influence upon the magnetic properties.

The metallographic investigation in relation to the magnetic properties showed that there was no distinctive structure which was characteristic for magnetic and non-magnetic steels.

Dr. E. Colver-Glauert (Sheffield) and Dr. S. Hilpert (Charlottenburg) dealt with the thermal-magnetic behaviour of 25 per cent. nickel steel, in continuation of previous researches. The range of temperature covered was 1,250° C. to − 180° C.

In fig. 1 they have plotted their results in the form of what may be regarded as the "life" of the alloy in respect of thermal-magnetic transformations.

The lower temperature-hysteresis loop of this diagram is essentially that discovered by Prof. Hopkinson, with the exception of minor differences as to the temperatures at which the transformations occur and the completeness thereof, as noted in the authors' earlier paper. The upper temperature-hysteresis loop explains the difficulties experienced in investigating the reasons for slow cooling results in a magnetic product, and the very different behaviour of quenched and slowly cooled specimens. If we assume this alloy to be heated to a high temperature and then allowed to cool, it follows the curved line to 950° C., after which the vertical line is followed to slightly below zero. Cooling below this point results in a sudden increase in the magnetisability, when − 10° C. is reached, followed by a gradual increase to − 180° C. Subsequent heating pro-

duces a slight gradual increase up to 450° C., with a (magnetic) softening of the material. Above this temperature there is a rapid falling off in the magnetisability, this reaching a minimum which is practically zero at 700° C. On continuing the heating above this point an increase occurs, reaching a maximum at 950° C., at which point the original curve is regained and followed in an upward direction. A specimen cooled or quenched on a heating curve from any point between 700° C. and 950° C. will follow a vertical line from that point to — 10° C., further cooling resulting in an

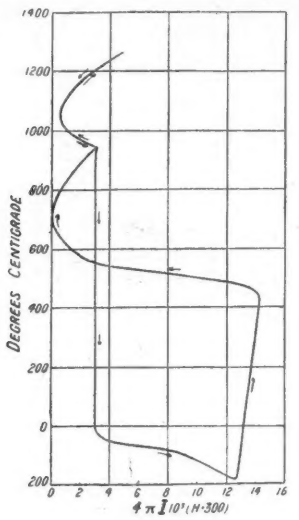


Fig. 1.

increase in the magnetisability until the line below zero in the diagram is reached and followed. Further, a specimen, unless it has been rendered non-magnetic, in which case it follows a vertical line, will, on being reheated from any temperature between 400° C. and — 180° C., follow a line parallel with that from — 180° C. to 450° C. until the cross line is cut, when the latter will be followed.

The chief point which the authors bring forward is the existence of the temperature-hysteresis loop in the alloy between 450° C. and 900° C. These further experiments and facts only strengthen their view that the allotropic theory of iron alloys in regard to their magnetic properties is totally untenable.

Cast-Iron Pipes and Superheated Steam.

In a paper on "The Growth of Cast-Irons after Repeated Heatings," Prof. H. F. Rugan, of New Orleans, gives the following conclusions:—

1. The strength of the outer fibre of the scale surfaces of a casting is greater than that of the metal taken from other portions of a casting.

2. The temperature encountered in pipe lines using superheated steam is sufficiently high to produce disintegration in a casting, causing it to grow and become correspondingly weak.

3. Grey cast-iron fittings of ordinary mixtures are unfit for use in pipe lines designed for superheated steam.

The Institute of Metals.

At the Autumn meeting of the Institute of Metals, held last month, the proceedings dealt mainly with the physical characteristics, and the effect of various methods of treatment on the microstructure of metals and alloys. Copper and alloys of copper with other metals figured largely in these researches, but the observations made as a rule had no obvious bearing on the use of copper in the electrical industries.

The effect of the presence of oxygen in brass was dealt with by Prof. T. Turner, of Birmingham University, who stated that brass poured at a lower temperature than usual was apt to be of inferior quality, and that the inclusion of oxide of zinc in this way might account for the rapid and irregular corrosion of condenser tubes that was sometimes met with. The oxygen must be present as oxide of zinc, because metallic zinc was proved to reduce copper oxide to metallic copper; and the zinc oxide was probably not dissolved, but mechanically entangled in the substance of the alloy. Unfortunately, no suitable process for the accurate determination of oxygen in brass appeared to be available.

The influence of oxygen on the properties of metals and alloys was also investigated by Mr. E. F. Law, who emphasised its extreme importance, and pointed out that, nevertheless, the subject had been almost entirely neglected on the scientific side, partly on account of the experimental difficulties attending the determination of oxygen. The trouble with oxidised metals was that they frequently passed the mechanical tests, and it was only when they were put into service that the real trouble began. It was in connection with the subject of corrosion that the question was of the most vital importance. The comparative freedom from corrosion of the Sandberg steel was due to its deoxidation by the addition of silicon.

Two papers dealt with the joining of metals. Mr. A. E. Tucker discussed the various methods in practical use. The highly injurious effect of the presence of zinc in tinman's solder was pointed out; when this occurs, a little acid in a soldering solution is a great help. Antimony increases the strength of the joint. The author drew attention to the beneficial effects of heating the parts to be joined, squeezing out as much of the soldering medium as possible, rubbing the surfaces together or with the soldering iron to improve the cohesion, &c. For joining thin steel tubing, as in bicycle frames, he would prefer soft soldering to brazing if the lugs were carefully machined to a close fit, as the metals employed in brazing and soldering injure the steel if sufficiently heated, though they have no similar effect on brass or copper, and soft solder flows better into the joint. One of the best fluxes for ordinary soldering contains chloride of ammonia, as well as chloride of zinc. The best "brazing" is done with silver solder, which is used in the blading of turbines. The alloy used consists generally of about 60 per cent. silver, 23 per cent. copper, and 17 per cent. zinc, with borax for the flux, with or without carbonate of soda. This mixture is very liquid in the molten state.

The presence of tin in brazing solder is highly detrimental to iron and steel parts, and results in unsatisfactory and unsafe joints.

By wrapping suitable brass wire round a joint and heating the joint by passing an electric current through it, while surrounded with a reducing gas, such as hydrogen or coal gas, a very perfect joint is obtained without the use of any flux, with the great advantage that there is no borax to clean off the joint. High-speed steel tools can be joined to mild steel shanks by using copper sheet or wire as the brazing solder; the joint is exceedingly strong, and withstands hardening temperatures. The Pick process for brazing cast-iron by first decarburising the iron with copper oxide and brazing with brass solder is very effectual.

Most of the special methods for soldering aluminium break down when the joint is exposed to warm steam, a very severe test. The best results are obtained with solder consisting almost entirely of aluminium, the flux being a mixture of alkaline aluminium chloride with potassium or calcium fluoride, damped with alcohol. Aluminium alloys can be joined with soft solder if the parts are first coppered by electro-deposition.

The rest of Mr. Tucker's paper, and the whole of that by Dr. F. Carnevali, of Turin, related to autogenous welding, which has extended enormously in recent years, and has replaced other methods in many cases.

Mr. Tucker laid down the following conditions for success as applying to all welding with acetylene or other hydrocarbons:—The use of pure gases; the use of a metal rod of approximately the same composition as that of the work to be joined; thorough fusion of the inside surfaces before the additional metal is applied; cleanliness of the parts, and when desirable the use of suitable deoxidising and fluxing powders, such as charcoal and borax; and the use of a blowpipe capable of complete control in respect of size of flame and proportion of mixture. He anticipated the general substitution of this method for ordinary brazing in work of the first quality. Acetylene and electric welds in steel should not be hammered while the weld is being made. A good fusion weld very seldom breaks at the point of welding.

The author, referring to the Thermit process, spoke of its extreme beauty and simplicity; "we have here a small steel foundry not much larger than a silk hat, from which the metal pours in a perfectly liquid state." He thought it very probable that in point of strength most Thermit welds were superior to those electrically made.

A couple of pages were devoted to arc and resistance welding. The use of "spot-welding" instead of riveting was described; a skilled workman can make 1,000 welds per hour with the spot-welding machine on plain sheets. Water-tight welding is also practised, the seam being passed slowly through the machine, which is coming into very extensive use. Enamelled goods thus welded instead of riveted are much superior to riveted goods. The welds are permanent even when exposed to alternate heating and cooling, which often loosens rivets. The manufacture of compound sheets of different metals welded together was also described.

Dr. Carnevali's paper described investigations which he had carried out on the autogenous welding of copper, brass, bronze and aluminium. The paper was illustrated by a number of photographs of actual welds and weld fractures, as well as of microphotographs highly magnified in order to illustrate the structure of the welded metals.

Dr. Carnevali showed, in the case of copper and its principal alloys, that rapid heating and sudden fusion of the metals subjecte to welding, profoundly modified their physical and mechanical properties, developing within them strains and structural alterations which were detrimental to the metal. In the case of copper there was an average reduction of 50 per cent. in the capacity to resist fracture, and an increase of about 30 per cent. in brittleness, while the percentage of ductility was reduced to about a tenth of the original. In the case of bronzes and brasses it was not found possible to determine the extent of the deterioration in the mechanical properties, but this deterioration increased as the number of the constituents of the alloys subjected to welding increased. In the case of alloys made up of several constituents, these might be improved after welding by a suitable heat treatment, thus relieving the internal strain set up by the sudden temperature changes involved in the process of welding.

The author concluded that the oxy-acetylene welding of copper and its principal alloys had a practical application limited to those

Parts of machinery which were not of large dimensions, and which were not subjected to severe mechanical stresses.

As regarded the autogenous welding of aluminium, the author observed that the sudden heating and rapid fusion of the metal subjected to the welding process altered the physical and mechanical properties in a manner analogous to that noticed in the case of copper, but to a less degree. The structural modifications principally took the form of coarse crystallisation of the metal. His experiments showed that both by hammering and by re-heating to 450-500° C. the homogeneity of the weld-zone was increased ; and that whenever aluminium contained small quantities of other elements easily oxidised at high temperatures, *e.g.*, copper, the oxidisation of the metal by fusion was facilitated, also the inclusion within it of granules of oxide detrimental to the mechanical properties of the weld-zone.

However, when carried out with the necessary precautions, the oxy-acetylene autogenous welding of aluminium was held by Dr. Carnevali to be capable of extensive practical application, especially for the welding of small machine parts.

TRADE STATISTICS OF JAPAN, 1911.

The following statement, showing the imports into and exports from Japan of electrical and similar goods during the year 1911, is taken from the recently issued official trade statistics; the figures for 1910 are given for purposes of comparison, and notes of any increases or decreases are added :—

	1910. Yen.	1911. Yen.	Increase or decrease. Yen.
Galvanised iron wire.—			
From Great Britain ...	59,000	109,000	+ 50,000
„ Germany	1,979,000	1,963,000	— 16,000
„ Belgium	75,000	67,000	— 8,000
„ Austria	15,000	11,000	— 4,000
„ United States ...	150,000	179,000	+ 29,000
„ Other countries ...	3,000	13,000	+ 10,000
Total ...	2,281,000	2,342,000	+ 61,000
Rails.—			
From Great Britain ...	53,000	229,000	+ 176,000
„ Germany	782,000	1,837,000	+1,055,000
„ Belgium	161,000	216,000	+ 55,000
„ United States ...	599,000	3,220,000	+2,621,000
„ Other countries ...	1,000	2,000	+ 1,000
Total ...	1,596,000	5,504,000	+3,908,000
Posts for electric wire materials for building, &c.—			
From Great Britain ...	365,000	719,000	+ 354,000
„ Germany	34,000	205,000	+ 171,000
„ United States ...	332,000	1,138,000	+ 806,000
„ Other countries ...	20,000	58,000	+ 38,000
Total ...	751,000	2,120,000	+1,369,000
Submarine and underground cables.—			
From Great Britain ...	1,045,000*	179,000	— 866,000
„ Germany	438,000	197,000	— 241,000
„ United States ...	109,000	—	— 109,000
„ Other countries ...	3,000	—	— 3,000
Total ...	1,595,000	376,000	—1,219,000
* Abnormal year.			
Insulated electric wire.—			
From Great Britain ...	825,000	1,490,000	+ 665,000
„ France	35,000	66,000	+ 31,000
„ Germany	403,000	1,758,000	+1,355,000
„ Italy	22,000	85,000	+ 63,000
„ United States ...	343,000	297,000	— 46,000
„ Other countries ...	9,000	4,000	— 5,000
Total ...	1,637,000	3,700,000	+2,063,000
Parts of electric cars.—			
From Great Britain ...	247,000	199,000	— 48,000
„ Germany	113,000	496,000	+ 383,000
„ United States ...	464,000	764,000	+ 300,000
Total ...	824,000	1,459,000	+ 635,000
Steam engines.—			
From Great Britain ...	397,000	364,000	— 33,000
„ Germany	14,000	60,000	+ 46,000
„ United States ...	194,000	123,000	— 71,000
Total ...	605,000	547,000	— 58,000
Gas engines, petroleum engines and hot-air engines.—			
From Great Britain ...	448,000	758,000	+ 310,000
„ Germany	23,000	237,000	+ 214,000
„ Belgium	7,000	—	— 7,000
„ Sweden	19,000	49,000	+ 30,000
„ United States ...	19,000	32,000	+ 13,000
„ France	5,000	33,000	+ 28,000
Total ...	521,000	1,109,000	+ 588,000
Steam boilers.—			
From Great Britain ...	462,000	1,465,000	+1,003,000
„ Germany	4,000	27,000	+ 23,000
„ United States ...	18,000	185,000	+ 167,000
„ Other countries ...	—	1,000	+ 1,000
Total ...	484,000	1,678,000	+1,194,000
Electrical machinery.—			
From Great Britain ...	611,000	1,081,000	+ 470,000
„ Germany	634,000	2,755,000	+2,121,000
„ Belgium	1,000	6,000	+ 5,000
„ Italy	26,000	16,000	— 10,000
„ United States ...	902,000	1,811,000	+ 909,000
„ Other countries ...	18,000	42,000	+ 24,000
Total ...	2,192,000	5,711,000	+3,519,000
**Hydraulic motors.*—			
From Great Britain ...	29,000	64,000	+ 35,000
„ France	16,000	35,000	+ 19,000
„ Germany	159,000	494,000	+ 335,000
„ Belgium	7,000	14,000	+ 7,000
„ Italy	—	19,000	+ 19,000
„ Switzerland ...	—	10,000	+ 10,000
„ United States ...	136,000	6,000	— 130,000
„ Other countries ...	2,000	—	— 2,000
Total ...	349,000	642,000	+ 293,000
* New heading in 1911.			
Lifting machines.—			
From Great Britain ...	256,000	394,000	+ 138,000
„ Germany	11,000	46,000	+ 35,000
„ Belgium	18,000	—	— 18,000
„ United States ...	41,000	136,000	+ 95,000
„ Other countries ...	—	2,000	+ 2,000
Total ...	326,000	578,000	+ 252,000
Caoutchouc and gutta-percha, crude.—			
From British India ...	91,000	237,000	+ 146,000
„ Straits Settlements	1,246,000	1,383,000	+ 137,000
„ Dutch India ...	142,000	161,000	+ 19,000
„ Great Britain ...	959,000	935,000	— 24,000
„ Germany	42,000	7,000	— 35,000
„ United States ...	246,000	253,000	+ 7,000
„ Other countries ...	316,000	84,000	— 232,000
Total ...	3,042,000	3,060,000	+ 18,000

The exports of dynamos and electric motors from Japan in the years 1910 and 1911 were as follows :—

To China	52,000	161,000	+ 109,000
„ Kwantung Province ...	151,000	145,000	— 6,000
„ Corea	104,000	—	— 104,000
„ Asiatic Russia	2,000	—	— 2,000
„ Philippine Islands ...	3,000	3,000	—
„ Siam	7,000	4,000	— 3,000
„ Australia	5,000	3,000	— 2,000
„ Hong Kong	—	34,000	+ 34,000
„ British India ...	—	7,000	+ 7,000
„ Straits Settlements ...	—	7,000	+ 7,000
„ United States	—	5,000	+ 5,000
„ Other countries ...	3,000	9,000	+ 6,000
Total ...	327,000	378,000	+ 51,000

Yen = 2s. ½d.

Electrochemistry in Norway.—Det Norske Nitritaktieselskab is the title of a company which has been launched by Det Norske Aktieselskab for Elektrokemisk Industri and the Société Générale des Nitrures. Its capital is 15,000,000 fr., and it is intended to work the French patents of the Serpek process for the production of ammonia. A power station of 25,000 H.P. is to be built in the Arendal, in Norway, making use of a local waterfall.—*Elek. Zeitschrift.*

Ship Struck by Lightning.—The *Times* reports that the barque *Helios*, from Antofagasta, meeting with bad weather in the South Atlantic, was struck by lightning, which brought down the foretop-mast and foretop-gallant-mast with all the yards attached.

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

21,573. "Telephone switchboards." W. Aitken. September 23rd.

21,586. "Manufacture of artificial filaments." L. Sarason. September 23rd. (Complete.)

21,645. "Electric circuit interrupting devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 23rd.

21,664. "Telephonic receivers." A. Marr. September 24th.

21,700. "Trolley heads for electric tramcars, locomotives and the like." L. Johnson and G. W. Green. September 24th.

21,725. "Holders for telephones." G. B. Stern. September 24th.

21,739. "Electrodes for galvanic cells." Friedrich Dietz (firm of). (Convention date, September 26th, 1911, Germany.) September 24th. (Complete.)

21,743. "Wireless telegraph systems." W. H. Shephard and A. E. McKechnie. September 24th.

21,761. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 24th.

21,762. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. September 24th.

21,783. "Electric fittings." W. Geipel. September 25th.

21,813. "Electrical regulating apparatus." Soc. Ed. Gabbeau et P. Delaux. (Convention date, February 9th, 1912, France.) September 25th. Complete.)

21,822. "Cooling arrangements for dynamo-electric machinery." Siemens Bros. Dynamo Works, Ltd., and E. O. Kieffer. September 25th.

21,831. "Safety devices for the cables or overhead conductors of direct and alternating-current installations." Bergmann Elektricitats-Werke Akt.-Ges. (Convention date, September 25th, 1911, Germany.) September 25th. (Complete.)

21,832. "Electrically operated means for restoring the equilibrium of inclined bodies." J. M. Smits. (Divided application on 15,667, 1912, August 7th.) September 25th.

21,866. "Ventilation of dynamo-electric machines." British Thomson-Houston Co., Ltd., and H. W. Taylor. September 25th.

21,867. "Electric oil switches." British Thomson-Houston Co., Ltd. Allgemeine Elektricitäts Ges., Germany.) September 25th.

21,882. "Telescopic, teinoscopic, deep-sea detachable observatory, combined with bellows bodies, air-tight chambers, air compressors, vacuum and hydraulic pumps, lenses, recording instruments, hollow ram cable, attachers, magnets, telephone, wireless telegraph instruments, drills, lathes, explosive ejectors, firing appliances, electric light, heat, and power searchlights." T. H. Holroyd. September 26th.

21,898. "Securing electric conduit fittings and the like." D. L. J. Broadbent. September 26th.

21,913. "Electric switches." A. P. Lundberg, G. C. Lungberg and P. A. Lundberg. September 26th. (Complete.)

21,917. "Portable electric lamps." Hartmann & Braun, Ltd., Akt.-Ges. (Convention date, September 30th, 1911, Germany.) September 26th. (Complete.)

12,921. "Carbon electrodes for electric batteries." British Ever-Ready Electrical Co., Ltd. (A. Heil, Germany.) September 26th. (Complete.)

21,932. "Dynamos, motors, and like electrical machines." A. A. Price. September 26th. (Complete.)

21,939. "Electrical indicating or alarm apparatus." E. E. Weikel and D. Weikel. September 26th. (Complete.)

21,946. "Seats or holders for connecting cord plugs for telephone exchanges and similar apparatus." Siemens Bros. & Co., Ltd., and E. A. Petithory. September 26th. (Complete.)

21,970. "Electric arcs for lighting or heating." C. J. Montgomery and R. C. Royston. September 27th.

21,971. "Conduit or tubular fittings for electrical conductors." E. P. Cottier and H. L. Downes. September 27th.

21,974. "Combined electric control for alternating and direct-current motors." C. B. Pinkerton and A. E. Wason. September 27th.

22,036. "Alarm devices for use with wireless telegraph systems." W. H. Shephard and A. E. McKechnie. September 27th.

22,049. "Portable electrically-driven centrifugal fans." S. C. Davidson. September 27th. (Complete.)

22,053. "Electric accumulators." G. Fuller, L. Fuller and G. J. A. Fuller. September 27th.

22,054. "Electric heating and cooking devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 27th.

22,093. "Electric pocket lamps." W. Knopf. September 28th. (Complete.)

22,099. "Electric motor and hand-driven sounding-machine." F. W. Clark. September 28th.

22,118. "Electric switches." H. H. Berry and W. J. Markham. September 28th.

22,127. "Controlling or regulating devices for electric lamps." E. Johnson. September 28th. (Complete.)

22,129. "Electrical protective apparatus." S. de Stefani. September 28th. (Complete.)

22,131. "Railway control telephone systems." J. N. C. Kennedy. September 28th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1911.

Electrical Terminals and Fuses. E. S. Anness. 17,598. August 2nd. (February 2nd, 1912.)

Transmitting Apparatus for Wireless Telegraphy. L. Rouzet. 19,948. September 7th.

Electric Contact Devices for Clock Movements. L. P. E. Appoullot. 20,149. September 11th. (September 9th, 1910.)

Electrically-Heated Cooking Ovens and the like. A. F. Berry. 20,172. September 11th.

Electrically-Operated Boat Hoists. J. Fielding. 20,383. September 14th. (Cognate application, 2,910 of 1912.)

Diaphragms of Telephonic Receivers and like Instruments. A. Marr. 20,434. September 15th.

Telegraphic Relays. S. G. Brown. 20,451. September 15th.

Production of Copper by Electrolysis. R. Douvreleur. 21,593. September 30th.

Combination Locks for Electrical Lamps and like Electrical Fixtures. G. Barker. (Midland Electrical & Manufacturing Co.) 22,276. October 10th.

Sparking Plugs. A. E. Fletcher. 24,941. November 9th.

Electric Arc Lamps. G. E. Tate. 29,035. December 23rd. (Cogdate application, 6,807 of 1912.)

1912.

Feeding Mechanism for the Electrodes of Electric Arc Lamps. F. Steinert. 1,755. January 22nd.

Method of Multiple-Control for Electric Motors. R. Richter and Maffei-Schwartzkopff-Werke Ges. 3,117. February 7th. (April 21st, 1911.)

Speed-Regulating Devices for Electric Motors, more especially for use in connection with Electrically-Controlled Continuous Spinning Frames. Firm of Jacquet Fréres. 4,691. February 24th. (February 24th, 1911.)

Telephone Exchange Circuits. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 4,698. February 24th. (Addition to 11,251 of 1910.)

Instrument for Measuring Frequencies, Self-Induction Coefficients and Capacities, and Ratios of Self-Induction Coefficients and Capacities. W. P. Thompson. (Ges. fur Drahtlose Telegraphie.) 7,657. March 29th.

Electrodeposition of Metals. A. Leuchter. 9,075. April 17th.

Electric Measuring Instruments. C. Hubert. 9,411. April 20th.

Insulators. T. Wittrin. 9,734. April 24th.

Combined Telephonic Transmitters and Receivers. W. P. Thompson. 12,545. May 28th. (June 20th, 1911.)

Selector for Automatic or Semi-Automatic Telephone Systems. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 18,430. August 10th.

Electric Driving of Thrashing Machines.—Recent tests by MM. Coupan and Vuaillet in the village of Chambly (Oise), compared the cost of thrashing by horse-power and by electrical energy. The same thrasher was used in each case, and was of the stationary type with a simple winnowing attachment; the beater was 1·6 m. long × 0·4 m. diameter, and the winnower 0·8 m. long × 0·6 m. in width. The cost of the thrasher alone was 900 fr., or 1,400 fr. complete for horse operation. Two horses drove the machine at speeds varying from 690 R.P.M down to 538 R.P.M., and thrashed 890 sheaves, each weighing 8·25 kg., per 10-hour day (assuming 50 minutes actual operation in each hour). Under this system, 34 days were required to thrash the complete crop of 30,000 sheaves.

The capital cost of the electrical equipment subsequently used, including a 5·5-H.P. motor and the necessary rheostat, cables and meter, was 1,000 fr., making a total investment, including the thrasher, of 1,900 fr. With electric drive the thrasher speed averaged 756 R.P.M., and owing to this high, constant speed, the output amounted to 1,275 sheaves per 10-hour day (still assuming 50 working minutes per hour); the whole crop could thus be thrashed in 24 days. The electrical consumption averaged 1·74 KW., costing 0·78 fr. per hour. In both cases four men were required to feed and operate the thrasher, and the actual costs of operation were as follows:—

	Horses.	*Electric motor.*
10 % depreciation and 4 % interest on 1,400 fr.	196 fr.	—
Do. on 1,900 fr.	—	266 fr.
2 horses, 34 days at 4 fr. 50 c. ...	306 fr.	—
Electrical energy, 340 KW.-hours at 45 c.	—	153 fr.
4 men, 34 days at 4 fr.	544 fr.	—
„ 24 days at 4 fr.	—	384 fr.
Oil, 34 days at 0·5 fr.	17 fr.	—
„ 24 days at 0·75 fr.	—	18 fr.
	1,063 fr.	821 fr.

For these data it appeared that the average cost of thrashing was 1·235 fr. per cwt. by horse labour, and 0·954 fr. per cwt. by electric motor, thus showing a saving of 22·8 per cent. in favour of electric driving. Of the total electrical input, 54·5 per cent. and 25·6 per cent. was respectively required to drive the beater and winnower unloaded; the total light load consumption of the thrasher = 80·1 per cent. of the full load input, and the consumption for thrashing without winnowing, was 0·52 KW. Such a motor as employed above could be applied to innumerable farm duties (including the preparation of cattle foods, &c.); hence, the whole capital charges should not be debited to the thrasher. Allowing for this, the advantage of electrical operation is yet greater in the above case.

The Cooper Hewitt Diffusing Lamp.—The *Electrical World* describes a system devised by Dr. P. Cooper Hewitt for obviating glare from metal-filament lamps and diffusing the light without sensible loss of efficiency; a series of fine, smooth, parallel grooves is formed on the outer surface of the bulb of the lamp, constituting a system of prisms, which may be either longitudinal or transverse. The grooves are less than one-hundredth of an inch in width, and are formed by dipping the bulb in wax, and then, after baking, ruling lines in the wax by means of a simple machine. Next the bulb is dipped in hydrofluoric acid for a suitable length of time, and finally the wax is removed, leaving etched grooves in the glass. The chemical method of grooving the glass has the advantage of preventing the fractures which might occur with a mechanical method, and it is possible to apply the chemical procedure to any commercial bulb. The effect of the treatment is to make the whole bulb appear luminous, and if the grooving is transverse, the distribution of the light is greatly modified, the horizontal illumination being diminished and the vertical illumination increased both upwards and downwards. Dr. Hewitt states that the loss in efficiency due to the grooving is negligible.